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The evaluation of pulmonary hydatid cyst and their surgical results in our region

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Abstract

The demographic characteristics, clinical and radiological findings, surgical procedures and surgical results of pulmonary hydatid cyst patients who underwent surgical treatment between 2009 and 2013 in our clinic were evaluated. Pulmonary hydatid cyst cases who underwent surgical treatment between 2009-2013 were analyzed retrospectively. A total of 84 (48.8%), 41 women and 43 (51.19%) men with pulmonary hydatid cysts were included in the study. Diagnosis was made by radiological evaluation in all hydatid cyst cases. In our study, one-way analysis of variance test and Chi-square test were used as statistical methods with the SPSS statistics package program. Of all 84 patients who were decided to undergo surgical intervention due to pulmonary hydatid cyst, 69 (82.14%) of them had single and 15 (17.85%) of them had multiple pulmonary hydatid cysts. Hydatid cyst was observed in the left lung in 30 patients (38%), in the right lung in 37 patients (44%), and bilaterally in 15 patients (18%). The most common (88.09%) preferred surgical procedure was cystotomy+capitonnage. In our study, no mortality related to hydatid cyst was observed. Hydatid cyst disease is an endemic disease in our country. It should be kept in mind in suspicious clinical and radiology situations as it may also progress without symptoms. The curative treatment of pulmonary hydatid cysts is surgical, and the cystotomy+capitonnage technique which we preferred the most in our study is a reliable procedure and radical parenchyma resections such as pneumonectomy, lobectomy or segmentectomy should be avoided as much as possible.

Keywords: Pulmonary, hydatid cyst, echinococcus granulosus

Introduction

Hydatid cyst is a zoonotic disease that is endemic in certain parts of the world. The true prevalence value is unknown as it can progress without symptoms [1]. The incidence of cystic Echinococcosis in endemic countries is around 1-220/100,000 [2]. In our country, the prevalence of the disease is reported to be 50-400/100,000 and its incidence as 3.4/100,000 [3]. Although hydatid cyst disease is among the mandatory diseases that has to be reported in our country [Group C (diseases to be reported within the scope of sentinel surveillance)], it has not been fully successful in its prevention and control [4].

The most common factor is the parasite called *Echinococcus granulosus*. Hydatid cyst disease is most commonly seen in the liver (55-75%) and secondly in the lungs (10-20%) in adults, whereas the most common site in children are the lungs [5-8].

In the medical treatment of hydatid cyst disease, benzimidazoles such as mebendazole and albendazole can be used [9,10]. Anthelmintic drugs lead to the perforation of the cyst by melting the wall of the cyst. The results of medical treatment in pulmonary hydatid cyst are not good because of the high risks it carries. The risk of massive hemoptysis and allergic reactions in patients undergoing medical treatment has been demonstrated by studies. Even if the parasite dies with the medical treatment, it opens a door to advanced complications due to infection on the perforated base, empyema, and recurrent lung infections. In the treatment of pulmonary hydatid cyst, surgery is a treatment method that preserves its validity because of the complications the cysts may cause, whether they are symptomatic or asymptomatic [11,12]. It has been reported that the only effective treatment of pulmonary hydatid cyst is surgical excision, and surgical treatment is indicated in all symptomatic cysts and/or growing or infected cysts [13].

In this study, demographic characteristics, clinical and radiological findings, surgical procedures and surgical results of pulmonary hydatid cyst patients who underwent surgical treatment in Yuzuncu Yil University Faculty of Medicine, Department of

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Thoracic Surgery between 2009-2013 were evaluated.

Materials and Methods

In this study, patients with pulmonary hydatid cysts who underwent surgery in Yuzuncu Yil University Faculty of Medicine, Department of Thoracic Surgery between 2009-2013 were reviewed retrospectively by scanning of the patient file archives, patient record program and outpatient clinic records in terms of age, gender, living conditions, symptomatology, the extent of involvement, additional organ involvement, the cyst being perforated/intact, the surgical procedure, the preoperative and postoperative complications, the localization of cysts detected preoperatively with diagnostic methods, the localization of cysts detected during surgery, hospital admission findings and hospital stay time.

In addition to clinical examination and routine laboratory examinations, chest x-ray, computed tomography, ultrasonography and magnetic resonance imaging methods were used in the diagnosis. Serological tests were not used routinely due to their low diagnostic values.

As the surgical intervention, cystotomy+capitonnage in 74 patients, wedge resection in 6 patients, lobectomy in 1 patient, segmentectomy in 1 patient, enucleation in 2 patients were performed. The most performed technique was the cystotomy+capitonnage technique. After a posterolateral thoracotomy, the surrounding tissues were protected with saline and/or 10% povidone-iodine impregnated compresses. The cyst content was aspirated, cystotomy was performed and the germinative membrane was taken to a bowl consisting of 10% povidone-iodine solution. After the cyst cavity was completely cleaned, hypertonic saline solution and/or 10% povidone-iodine was added as a scolosidal agent and waited for five minutes. The cyst cavity was cleaned again with saline and 10% povidone-iodine impregnated gauze compresses. Open bronchial mouths were sutured separately. Starting from the bottom of the cavity, all the walls were sutured in several stages all around, provided that the shape of the lung was not deformed, and then either capitonnage was performed by closing the cyst pouch from the bottom upwards or the cyst resection, enucleation or wedge resection was performed after the surrounding tissues were preserved.

In the postoperative period, albendazole treatment was started in all of the cases that had no contraindications. Albendazole was not used in pregnant women and those with high liver enzymes.

Statistical Analysis

For the properties that are emphasized; the descriptive statistics for continuous variables were expressed as average, standard deviation, minimum and maximum values, while for categorical variables they were expressed as numbers and percentages. One-way analysis of variance was performed in comparing the averages according to categorical variables in terms of continuous

variable(s) (age). Chi-square test was used in determining the relationship between categorical variables. In addition, multiple correspondence analysis was performed to graphically show the relationship between all categorical variables. Statistical significance level was taken as 5% in calculations and SPSS statistical software was used for calculations.

Results

Between September 2009 and April 2013, 84 patients with pulmonary hydatid cysts were operated in Yuzuncu Yil University Faculty of Medicine, Department of Thoracic Surgery. The average age was 23.72 ± 15.78 (5-71 years old). 41 (48.8%) of our cases were female and 43 (51.19%) were male. As a result of the comparative statistical analysis of the cases by age and gender distribution, no statistically significant difference was found between the two groups ($p > 0.05$).

It was determined that 37 (44.04%) of the patients lived in urban areas and 47 (55.95%) lived in rural areas (Table 1). The statistical analysis of the gender distribution of the cases according to their place of living was not found to be significant ($p = 0.394$).

Table 1. Distribution of cases according to urban-rural settlements

	Animal Husbandry	Dog Care	Total Patient Number
Urban	-	8 (9.52%)	37 (44.04%)
Rural	29 (34.52%)	34 (40.47%)	47 (55.95%)

While 61.9% of the patients applied to our clinic with the complaint of cough, the rate of the patients who were asymptomatic and diagnosed incidentally was 19.04% (Figure 1).

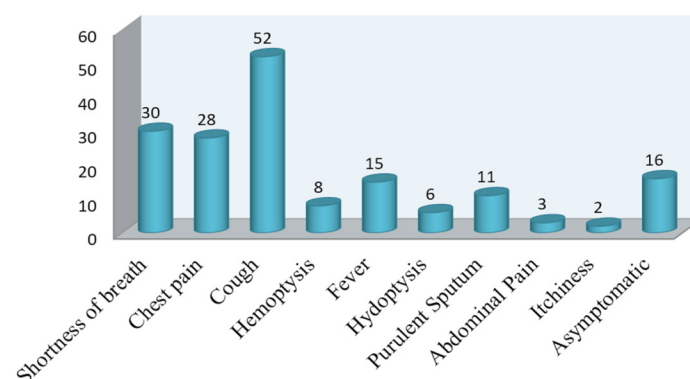


Figure 1. Symptoms

Of all 84 patients who were decided to undergo surgical intervention due to pulmonary hydatid cyst, 69 (82.14%) of them had single and 15 (17.85%) of them had multiple pulmonary hydatid cysts. Hydatid cysts were observed in the left lung in 32 (38%) patients, in the right lung in 37 (44%) patients, and bilaterally in 15 (18%) patients (Figure 2). Statistical analysis of cyst hydatid lesions between the localization in the lung and number of hydatid cysts was found to be significant for both groups ($p = 0.000$).

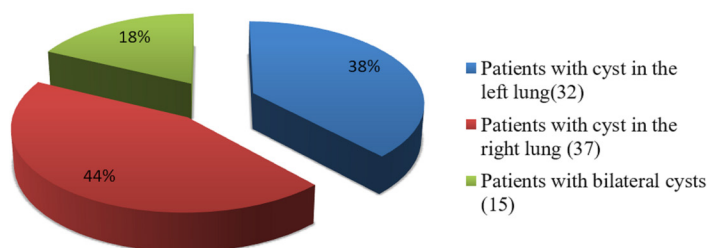


Figure 2. The distribution of cyst localizations

With multiple cysts, 71 (52.59%) of the cysts were intact and 64 (47.40%) were perforated. While 67 (79.76%) of 84 cases examined had isolated lung involvement, 17 (20.23%) had additional organ and/or tissue involvement. Hydatid cysts were detected in the liver in 16 (19.04%) of these patients, in the spleen in 3 (3.57%), in the brain in 1 (1.19%), and in the subcutaneous area+costa in 1 (1.19%) of the patients. The distribution of cases according to additional organ involvement is shown in Table 2.

Table 2. The distribution of additional organ involvement

Concomitant organ cyst	Number of patients
Liver	12 (14.28%)
Liver+ Spleen	3 (3.57%)
Liver + Brain	1 (1.19%)
Subcutaneous + Costa	1 (1.19%)

Thirty of the cases (35.71%) referred with complications of the cyst. Among these, pleural thickening and empyema (8.33%) were the most common (9.52%) (Table 3).

Table 3. The distribution of pathologies at the time of application

Referral pathologies	Number of cases
Pneumothorax	3 (3.57%)
Pleural Effusion	2 (2.38%)
Anaphylactic Reaction	2 (2.38%)
Hydropneumothorax	4 (4.76%)
Empyema	7 (8.33%)
Pneumonia	4 (4.76%)
Pleural Thickening	8 (9.52%)

A total of 94 surgical procedures were performed including surgical interventions in different sessions, Four patients did not apply to our clinic for the second session of operation. Muscle-sparing thoracotomy was preferred most frequently (69%) (Figure 3).

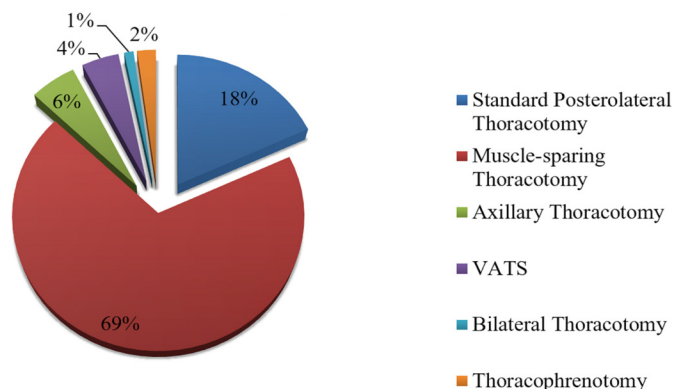


Figure 3. Performed thoracotomy methods

The most preferred (88.09%) surgical procedure was cystotomy+capitonnage (Figure 4).

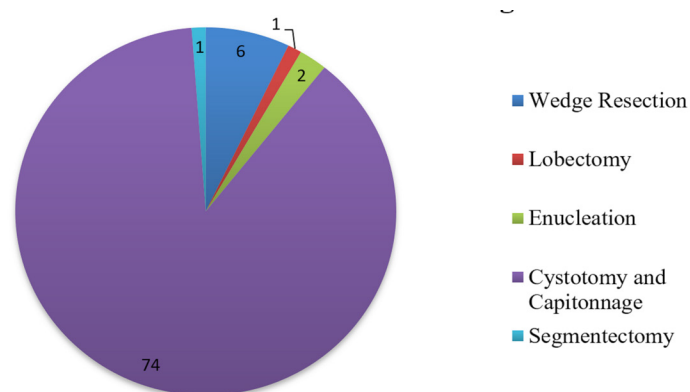


Figure 4. Performed surgical methods

The mean hospitalization time of our cases was 8.57 ± 17.1 days, and postoperative complications developed in 18 (21.42%) cases. The most common (7.14%) complication was pneumothorax recurrence after the removal of the chest tube, and secondly it was found to be atelectasis (4.76%) (Figure 5).

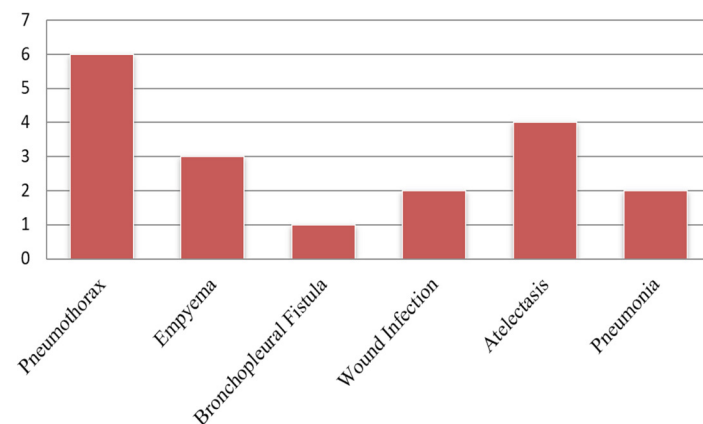


Figure 5. Postoperative complications

Lobe and segment involvements are summarized in Table 4, including the number of multiple cysts with intraoperative evaluation of 84 patients who underwent surgery. It was determined

that the most common involvement was in the lower lobe of the right lung and especially in the posterobasal segment (11.1%).

Table 4. Localization of the cysts by lobes and segments

Right Lung	Upper Lobe	Apical Segment	5 (3.7%)
		Anterior Segment	8 (5.92%)
		Posterior Segment	13 (9.62%)
	Middle Lobe	Medial Segment	5 (3.7%)
		Lateral Segment	8 (5.92%)
		Superior Apical Segment	13 (9.62%)
	Lower Lobe	Medial Basal Segment	3 (2.22%)
		Anterobasal Segment	11 (8.14%)
		Lateral Basal Segment	6 (4.44%)
		Posterobasal Segment	15 (11.11%)
Left Lung		Apical Segment	2 (1.48%)
		Posterior Segment	3 (2.22%)
		Anterior Segment	6 (4.44%)
	Upper Lobe	Lingular Superior Segment	4 (2.96%)
		Lingular Inferior Segment	1 (0.74%)
		Superior Segment	7 (5.18%)
	Lower Lobe	Basal Medial Segment	5 (3.7%)
		Anterobasal Segment	10 (7.40%)
		Laterel Basal Segment	4 (2.96%)
		Posterobasal Segment	6 (4.44%)

Discussion

Hydatid cyst disease is an endemic disease in certain parts of the world. It is a parasitic disease caused by *Echinococcus granulosus* and is common in our country. The true prevalence is unknown as it can also progress without symptoms [1]. The incidence of cystic Echinococcosis in endemic countries is around 1-220/100,000 [2]. In Turkey which is among the endemic countries, the prevalence of the disease is reported to be 50-400/100,000 and its incidence as 3.4/100,000 [3].

In our country, the regions where hydatid cyst is endemic are Southeastern Anatolia, Central Anatolia and especially Eastern Anatolia regions [14]. Hydatid cyst is more common in rural areas. Kalyoncu et al. [12,15] found the prevalence of hydatid cyst disease in rural areas as 1.05% in a study conducted in 1988 covering the adult age group. In their series of 30 patients with

hydatid cysts Yalcinkaya et al. [16] reported that 25 patients had a history of dog contact. Forty-seven of our cases (55.9%) lived in the rural areas and 29 of them (34.52%) were engaged in animal husbandry.

Hydatid cyst disease can be seen at any age. Although the age of onset in the cases vary, it was observed that in most of the studies performed in our country they were between the ages of 20-50. In our study, the average age of the patients is $23,72 \pm 15,78$ and it is compatible with the literature.

There are different results about the gender distribution of hydatid cyst disease. As similar studies, the case of hydatid cyst in women was found to be 54.78% by Asci et al. [17], 45.5% by Sayir et al. [18], 57.5% by Cobanoglu et al. [19], and 51.2% by Yazar et al [20]. In our study, hydatid cyst disease was found in 48.8% of the women and 51.19% of the men, and it was found that it was more common in men. When evaluated statistically, no significant difference was found between the genders ($p > 0.05$).

Diagnosis of hydatid cyst is made by patient history, ultrasonography and other radiological imaging techniques (such as chest radiography, computed tomography, magnetic resonance imaging) as well as serological tests and microscopic examination [21]. In our study, while serological tests were not used due to their low diagnostic values, other diagnostic steps recommended in the literature were used. All of the cases were evaluated by conventional chest radiography for pulmonary hydatid cyst and abdominal ultrasonography for abdominal hydatid cyst. Diagnosis was supported by thoracic and abdominal computed tomography and magnetic resonance imaging in cases that it was deemed necessary to clarify the diagnostic distinction in both techniques.

Pulmonary hydatid cyst generally settles in the right lung and lower lobes [15]. Pulmonary hydatid cysts mostly have single localization however they can also seen in multiple localizations [22]. Sixty percent of the pulmonary hydatid cysts are localized in the lower lobes and 20% are localized bilaterally [23]. Tor et al. [12] stated in their study that the right lung was involved a little more than the left lung. Yalcinkaya et al. [16] stated that they found more focus in the right lung in their studies. In our study, in accordance with the literature, 69 (82.14%) had single pulmonary involvement, and 15 (17.85%) had bilateral involvement. It was detected that the most common location of the cysts among both lungs was the right lung's (64.44%) lower lobe posterobasal segment (11.11%). Statistical analysis between lung localization of hydatid cyst lesions and hydatid cyst count was found to be significant for both groups ($p = 0.000$).

Hydatid cyst is often asymptomatic. When they reach large sizes and compress or complicate the lung, they give symptoms [24]. Cough, dyspnea, fever, chest pain, hemoptysis, skin rashes can be observed. The most diagnostic symptom is expectoration (hydoptysis) of the cyst fluid or the membrane as a result of the perforation. In our study, 19.04% of the cases were asymptomatic, and the most common symptom was cough (61.90%). Hydoptysis was observed in 6 (7.14%) of our cases. Some publications report that hydatid cyst can be seen with clinical manifestations such as pneumothorax (2.4-9%) and empyema (6%) [25]. Consistent with this, in our study, there were complications in 30 (35.71%)

patients, the most common being pleural thickening (9.52%) and empyema (8.33%) during the initial admission to the hospital. We attribute this to the late application to the physician due to the socio-economic and cultural structure of our region.

The clinical situation varies according to the perforation of the cyst, whether it is opened to the pleura or bronchus. In complicated cysts, rupture into the pleural cavity (hydropneumothorax), rupture into the bronchi (drowning, bronchospasm, anaphylactic reaction), rupture into the mediastinum (sudden rupture into the trachea or bronchus) and inflammation can be seen. Although pleural complications were reported at a rate of 0.5–18.2% [26], Aribas et al. [27] reported that these complications were higher. Sayir et al. [28] reported the complicated hydatid cyst rate as 42.71% in their study with 412 patients. It was reported that 56.8% of them ruptured into the bronchial tree and 43.2% into the pleural cavity. In our study, with multiple cysts being taken into account, 71 (52.59%) of the cysts were intact and 64 (47.40%) were perforated. In the literature, rupture is shown as the most common complication of pulmonary hydatid cyst with an incidence of 49%, which is compatible with our findings [29].

Lung and liver involvement can also be seen observed simultaneously in 4-25% of all hydatid cyst cases [30]. In our study, an additional organ cyst was found in 17 (20.23%) of 84 patients, most commonly in the liver (19.04%).

In the treatment of pulmonary hydatid cyst, surgery is a treatment method that preserves its validity due to the complications the cysts may cause, whether symptomatic or asymptomatic [30]. Tor et al. [14] stated that the only effective treatment of pulmonary hydatid cyst is surgical excision, and surgical treatment is indicated in all symptomatic cysts and/or growing or infected cysts. A hydatid cyst that grows in the lung can cause atelectasis by the pressure on the bronchi, resulting in pneumonia, and may cause anaphylactic shock, infection or calcification in the lung [31]. In order to prevent these complications from occurring, we believe that all detected hydatid cysts should be treated and surgical treatment should be applied if there are no contraindications. We think that albendazole therapy can be given instead of the surgical treatment if the patient is considered to be inoperable or if it is not possible to remove all of the cyst (or cysts) by surgery, if the cysts are too large or have already spread to many organs. In the patients with pulmonary hydatid cyst, it is aimed to eliminate the parasite with surgical treatment, to prevent cyst rupture and subsequent spread during surgery and to remove the remaining cyst cavity by maximizing the lung tissue [31]. It was emphasized that unnecessary resections of the lungs should be avoided since the compressed lung is generally healthy and can be reventilated after the cyst is removed [25]. In many studies, it is stated that lung tissue should be protected as much as possible and resection has been suggested only in the destroyed lung [31]. When the studies on pulmonary hydatid cyst are examined, it is seen that the amount of radical resection (segmentectomy, lobectomy, pneumonectomy) is in a wide range. In published patient series, segmental resections were reported to be between 0% and 6.6%, lobectomies were between 0% and 7.4%, and pneumonectomies were between 0% and 0.2% [6,32]. In order to protect the lung tissue as much as possible, the lungs were ventilated during surgery after the cyst was removed, and lung tissue that is not adequately ventilated or with poor parenchymal

structure was resected. In our study, cystotomy+capitonnage was performed in 74 (88.09%) patients, and enucleation was performed in 2 (2.38%) patients. Wedge resections smaller than a segment were performed in 6 (7.14%) patients, and as radical resection; segmental resection was performed in one (1.19%) patient and lobectomy in one (1.19%) patient. In addition to these operations, 8 (9.52%) patients had decortication and 4 (4.76%) had empyema sac enucleation. In our study, parenchymal protective techniques were used as much as possible.

Synchronized lung and liver cysts are present in 4-25% of hydatid cyst cases [33]. Since right thoracotomy is mandatory in the right lung cysts and subdiaphragmatic liver cysts that are seen simultaneously, the liver cyst can be accessed via transdiaphragmatic way and two separate procedures can be performed in one step. The reliability and acceptable morbidity of this method has been shown in many studies [33,34]. In our study, thoracophrenotomy was performed in 2 (2.38%) patients with hydatid cyst located in the right lung's lower lobe and also in the liver dome.

Today, as a result of the developments in the field of videoendoscopy, thoracoscopic surgical intervention is becoming widespread in the treatment of pulmonary hydatid cyst. We also preferred thoracoscopy as a surgical method in 4 (4.76%) patients who were suitable for VATS.

After pulmonary hydatid cyst operation, morbidity is observed as 0-13% and mortality as 0-5% [35]. In giant pulmonary hydatid cysts, 5% more morbidity has been reported compared to simple cyst cases [36,37]. Mortality was not observed in 84 cases operated in our clinic, but early and late complications developed in eighteen (21.4%) of our cases. Our postoperative complication rate was 21.4% in eighteen cases.

In the medical treatment of hydatid cyst disease, benzimidazoles such as mebendazole and albendazole can be used [9,10]. Albendazole treatment was applied intermittently for a total of 3 months after the operation in our patients. During medical treatment, patients should be called for intermittent controls, and some examinations should be performed and caution should be taken because of a possibility of liver toxicity. In our cases, albendazole treatment was discontinued due to elevated liver enzyme in 7 (8.33%) patients.

As a result, pulmonary hydatid cyst continues to be an important socio-economic problem for our country. Although it is a benign pathology, it has severe morbidity and mortality because of compression and rupture of the surrounding tissues and because it may cause anaphylaxis. The curative treatment of hydatid cyst is surgical and cystotomy and capitonnage is the most common method. Conservative surgical approaches are reliable methods and are effective in most patients. For this reason, we believe that radical parenchymal resections such as pneumonectomy, lobectomy or segmentectomy should be avoided as much as possible.

Conflict of interest

The authors declare that they have no competing interest.

Financial Disclosure

All authors declare no financial support.

Ethical approval

Study was approved by the Yuzuncu Yil University, Clinical Researches Ethics Committee

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