



Intact and Perforated Pulmonary Hydatid Cyst: A Comparative Study from Damascus, Syria

Mohammad Almess, M.Sc., Basel Ahmad, M.D., Bassam Darwish, M.D.

Surgery Department, Faculty of Medicine, Damascus University, Damascus, Syria

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Corresponding author

Basel Ahmad

Tel 963-933470970

E-mail dr.baselahmad@gmail.com

ORCID

<https://orcid.org/0000-0003-3378-334X>

Background: Hydatidosis is a major health problem around the world, especially in the Mediterranean region. Cysts can break open or develop secondary bacterial infections, altering the clinical presentation.

Methods: Patients who underwent hydatid cyst surgery at Al-Mouassat University Hospital in Damascus, Syria between January 2006 and December 2017 were evaluated. Cases involving isolated hepatic cysts were excluded. The patients were divided into those with perforated hydatid cysts (group 1) and those with intact hydatid cysts (group 2).

Results: This study included 224 cases: 113 in group 1 (50.4%) and 111 in group 2 (49.6%). The median chest tube duration, hospitalization time, and postoperative complication rate were higher in group 1 than in group 2 ($p=0.003$, $p=0.002$, and $p=0.006$, respectively). In both groups, the most common symptom was cough (present in 178 patients in total [79.5%]), while chest pain (121 patients [54%]) and dyspnea (113 patients [50.4%]) were also common. Cough, hemoptysis, fever, and expectoration of cystic contents were significantly more frequent in group 1 than in group 2 ($p<0.001$).

Conclusion: The early discovery and treatment of intact pulmonary hydatid cysts reduced the hospitalization time, chest tube duration, and postoperative complication rate. Relative to intact cysts, perforated cysts are more complex and are associated with more expensive and time-consuming surgical treatment.

Keywords: Hydatid cyst, Pulmonary, Perforated, Intact, Syria

Introduction

Although hydatidosis is rare in developed countries such as central European nations, the United States, and Korea [1,2], it is a major health problem in many countries around the world, especially in the Mediterranean region [3]. Hydatidosis is caused by infection with the tapeworm *Echinococcus*, which belongs to the family Taeniidae [4]. The lungs and the liver are the most common sites of infection [4]. The initial phase of primary infection is asymptomatic. Over time, cysts can break or develop secondary bacterial infections. The presence of these complications alter the clinical presentation, either by causing new symptoms or by increasing the severity of existing symptoms. The principal complication is cyst perforation, which causes cyst material containing fragments of larval tissue and protoscolices to spill into the bronchial tree or pleural cavity

[5,6]. This complication makes treatment difficult, and some patients may require major surgery such as pulmonary lobectomy or liver resection, which is especially challenging in times of crisis [2,7,8]. In this retrospective study, our aim was to evaluate the clinical presentation and cystic location and compare these data according to cyst status (intact or perforated).

Methods

All patients who underwent hydatid cyst surgery at Al-Mouassat University Hospital in Damascus, Syria between January 2006 and December 2017 were evaluated for potential inclusion in this study. Cases involving isolated hepatic cysts were excluded.

Data were collected from hospital medical files. Standard demographic and clinic-pathological data were obtained,



including age, sex, presenting clinical symptoms, cyst location, cyst status (intact or perforated), the presence of synchronous hepatic cysts, hospitalization time, chest tube duration, and complications. Patients were divided into those with perforated hydatid cysts (group 1) and those with intact hydatid cysts (group 2). We compared these groups according to patient characteristics, cyst location, and hepatic cyst presence. On admission, a thorough clinical history was taken and a physical examination was conducted for all patients. Each patient also underwent chest radiography and chest computed tomography to determine the site and status of the pulmonary and (if present) concurrent hepatopulmonary cysts. Serological tests have not been routinely performed in our hospital due to the frequent lack of equipment during the Syrian crisis; additionally, these tests are not very reliable, and it is sufficient to instead rely upon experience with the very large number of cases in countries such as Syria where this condition is endemic. Bronchial washing is also not performed routinely at our institution. We operated on all complicated cysts and on intact cysts that were 3 cm or larger. After thoracotomy was performed and the cyst was accessed, aspiration, injection of 20% hypertonic saline, and re-aspiration were carried out. Then, the germinal membrane was excised en bloc. Bronchial fistulas and the bronchial cavity were closed with absorbable sutures. Medical treatment with albendazole was administered routinely unless contraindicated.

Descriptive analyses of variables were used to summarize the data, and the independent-samples t-test was used to compare continuous variables. The chi-square or Fisher exact test was used to compare quantitative variables. IBM SPSS for Windows ver. 23.0 (IBM Corp., Armonk, NY, USA) was used to analyze the data, and p-values less than 0.05 were considered to indicate statistical significance.

This study was approved by Damascus University in 2017 (research committee decision no., 368). Confirmed consent was waived.

Results

This study included 224 cases, 113 (50.4%) of which were in group 1 (perforated cysts) and 111 (49.6%) of which were in group 2 (intact cysts). Overall, 139 patients (62.1%) were female and 85 (37.9%) were male. Among the male patients, perforated cysts were more common than intact cysts. The median age was higher among patients with perforated cysts (28 years) than among the group with intact cysts (25 years).

The median chest tube duration, hospitalization time, and postoperative complication rate were higher in group 1 than in group 2 ($p=0.003$, $p=0.002$, and $p=0.006$, respectively). The characteristics of the patients are provided in Table 1.

Eighty-five of the 224 patients (37.9%) had hepatopulmonary cysts. Of these patients, 53 (62.4%) had intact pulmonary cysts. In contrast, 139 patients (62.1%) had only pulmonary cysts, which were intact for 58 patients (41.7%) (Table 2). Approximately half of the patients exhibited pulmonary hydatid cysts in the right lung (116 patients [51.8%]), while 71 patients (31.7%) had left-sided cysts. Bilateral cysts were found in only 37 patients (16.5%) (Table 3). Approximately three-quarters of the bilateral cysts were intact. Therefore, the 2 groups differed significantly with regard to the presence of bilateral pulmonary cysts ($p=0.001$).

Only 159 of the 224 patients (71%) had an isolated in-

Table 2. Pulmonary and hepatopulmonary cyst involvement

Location	Group 1 (perforated)	Group 2 (intact)	Total
Pulmonary involvement	81 (58.3)	58 (41.7)	139 (62.1)
Hepatopulmonary involvement	32 (37.6)	53 (62.4)	85 (37.9)

Values are presented as number (%).

Table 1. General characteristics

Characteristic	Group 1 (perforated)	Group 2 (intact)	Total	p-value
Sex				0.5
Male	45 (39.8)	40 (36)	85 (37.9)	
Female	68 (60.2)	71 (64)	139 (62.1)	
Age (yr)	28 (3–80)	25 (3–71)	26 (3–80)	0.4
Chest tube duration (day)	3 (2–14)	3 (1–6)	3 (1–14)	0.003
Hospitalization (day)	8 (3–28)	7 (2–20)	7 (2–28)	0.002
Complication rate	10 (8.8)	1 (0.9)	11 (4.9)	0.006

Values are presented as number (%) or median (range).

Table 3. Distribution of cysts in the lungs

Variable	Group 1 (perforated)	Group 2 (intact)	Total	p-value
Location				
Right lung	64 (55.2)	52 (44.8)	116 (51.8)	0.1
Left lung	40 (56.3)	31 (43.7)	71 (31.7)	0.2
Bilateral	9 (24.3)	28 (75.7)	37 (16.5)	0.001
Out of lobar involvement				
Right upper lobe	12 (44.4)	15 (55.6)	27 (17)	0.1
Middle lobe	6 (50)	6 (50)	12 (7.5)	0.6
Right lower lobe	37 (64.9)	20 (35.1)	57 (35.8)	0.1
Left upper lobe	16 (72.7)	6 (27.3)	22 (13.8)	0.1
Left lower lobe	19 (46.3)	22 (53.7)	41 (25.8)	0.1

Values are presented as number (%).

Table 4. Presenting symptoms

Clinical symptoms	Group 1 (perforated)	Group 2 (intact)	Total	p-value
Cough	104 (92)	74 (66.7)	178 (79.5)	<0.001
Hemoptysis	47 (41.6)	16 (14.4)	63 (28.1)	<0.001
Fever	68 (60.2)	27 (24.3)	95 (42.4)	<0.001
Abdominal pain	7 (6.2)	24 (21.6)	31 (13.8)	0.001
Dyspnea	63 (55.8)	50 (45)	113 (50.4)	0.06
Anorexia	22 (19.5)	12 (10.8)	34 (15.2)	0.06
Chest pain	55 (48.7)	66 (59.5)	121 (54)	0.1
Expectoration of cystic contents	32 (28.3)	-	32 (14.3)	<0.001
Asymptomatic	1 (0.9)	7 (6.3)	8 (3.6)	0.03

Values are presented as number (%).

involved lobe; cases with multiple-lobe involvement were omitted in this portion of the analysis to distinguish between an infected lobe and cystic perforation. The most common cyst location was the right lower lobe (57 patients, [35.8%]), while the left lower lobe was the cyst location in 41 patients (25.8%) (Table 3). No statistically significant difference was present with regard to the perforation rate by cyst location (p=0.1).

In both groups, the most common symptom was cough (178 patients [79.5%]), followed by chest pain (121 patients [54%]) and dyspnea (113 patients [50.4%]) (Table 4). Cough, hemoptysis, fever, and expectoration of cystic contents were significantly more frequent in group 1 than in group 2 (p<0.001). Dyspnea and anorexia were more frequent in group 1, but not to a significant extent (p>0.05). Abdominal pain and asymptomatic status were significantly more frequent in group 2 (p<0.05). Chest pain was more common in group 2 than in group 1, but the difference was not statistically significant (p>0.05).

Early complications occurred in only 10 patients in group 1 and 1 patient in group 2. Prolonged air leak oc-

curred in 5 patients (4 in group 1 and 1 in group 2). Other complications included atelectasis (n=2), bronchopleural fistula (n=1), acute hemorrhage (n=1), and pleural cavity formation (n=1) (all in group 1) as well as intrapleural thrombus formation. Reoperation was necessary in 3 cases, due to postoperative hemorrhage (n=1), bronchopleural fistula (n=1), and intrapleural thrombus formation (n=1).

Discussion

In our study, more than half of the cases involved perforated cysts (50.4%). A very similar frequency (53.1%) was seen in a study conducted by Ashour et al. [9], but a lower rate (41%) was observed in children under 16 years old in a study conducted by Onal and Demir [10]. The male-to-female ratio in the present study was 1:1.5 for group 1 and 1:1.7 for group 2, while it was 2:1 in both groups in the study by Ashour et al. [9]. In our study, the median chest tube duration was the same in both groups (3 days), but the range was larger in group 1 (2–14 days) than in group 2 (1–6 days), which may have been due to the higher compli-

cation rate observed in group 1 than in group 2 (8.8% versus 0.9%, respectively). A similar relationship regarding the complication rate was seen in the study by Onal and Demir [10], although the rates were higher (23.7% and 2.6% in group 1 and group 2, respectively). The hospitalization time was nearly equal in these 2 studies, although the range was higher in the present study. The median chest tube duration, hospitalization time, and complication rate were higher in cases involving complicated pulmonary cysts.

Our study was associated with the thoracic surgery department, so pulmonary involvement was more frequent than hepatic involvement. The presence of synchronous liver cysts was associated with a lower frequency of perforated pulmonary cysts (37.6% versus 58.3%) (Table 2). This may have been due to the presenting symptoms related to hepatic cysts (abdominal pain), which can lead to the discovery of pulmonary cysts during investigation. Additionally, bilateral lung cysts had a lower percentage of perforation (Table 3), perhaps because the associated symptoms were more severe, prompting an earlier evaluation. The differences between the groups with regard to concurrent hepatic and bilateral cysts were statistically significant ($p=0.003$ and $p=0.001$, respectively).

The distribution of lung involvement is shown in Table 3. The most common cyst location was the lower lobes, particularly the right lower lobe. The same was seen in the study by Onal and Demir [10]. In the present study, a relatively high rate of cyst perforation was observed in the left upper lobe (72.7%), potentially because lingual cysts have no room to grow and are surrounded by rigid structures (the chest wall and heart).

Cough was seen more frequently in group 1 than in group 2 due to fluid irritation from the perforated cysts (in group 2, cough was caused by pressure affecting the bronchial tree). Fever and hemoptysis were also more common in group 1 due to the nature of perforated cysts. The presence of a foreign body-containing cavity and the connection to the bronchial tree create a fertile environment for infection to develop. In contrast, these symptoms in group 2 arose from infection in the pulmonary tissue around the cyst. Expectoration of cystic contents was seen only in cases involving perforated cysts, and the percentage (28.3%) was very modest. Patients tend to neglect to mention this symptom, so clinicians should ask their patients about fluids coming from their chest when coughing, as this symptom is very important and carries a specific meaning in the context of pulmonary hydatid cysts. Abdominal pain was more frequent in group 2 than in group 1, which may

have been related to the discovery of pulmonary cysts on radiological imaging studies performed after hospital admission.

In conclusion, the findings of this study confirm that the early detection and treatment of intact pulmonary hydatid cysts reduce the hospitalization time, chest tube duration, and postoperative complication rate. Relative to the symptoms of intact cysts, the symptoms of perforated cysts are more frequent and dangerous and may be life-threatening. Perforated cysts are more complex than intact cysts and are associated with more expensive and time-consuming surgical treatment.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

ORCID

Mohammad Almess: <https://orcid.org/0000-0002-3626-162X>

Basel Ahmad: <https://orcid.org/0000-0003-3378-334X>

Bassam Darwish: <https://orcid.org/0000-0003-4006-7616>

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