

Original article

Complicated hydatid cysts of the lung: surgical treatment in Kurdistan of Iraq

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Abstract

Objective: To review the problems encountered in surgical treatment of complicated pulmonary hydatid cysts and to evaluate the functional results in the surgery of complicated hydatid cysts. **Methods:** The medical records for 89 patients with complicated pulmonary hydatidosis were retrospectively investigated. The series consisted of 47 male and 42 female patients with a mean age of 32 ± 8 years. Study performed during January 2000 to December 2007, all patients were treated surgically. Data related to surgical procedures performed, postoperative morbidity, hospitalization time, and cyst recurrence were collected from each individual's records, and the group findings were compared. **Results:** Among these cysts, 58 were perforated, 23 were infected, and 13 were cysts with pleural complications. Cystotomy plus capitonnage was the most frequently performed operative technique ($n = 43$), followed by cystotomy plus closure of bronchial openings ($n = 28$), pericystectomy plus capitonnage ($n = 13$), decortications ($n = 7$), lobectomy and segmentectomy ($n = 3$). The 11 cases with co-existing liver cysts were approached by right thoracophrenotomy. Postoperative complications developed in 12 patients (13.4%). **Conclusion:** Surgery is the primary mode of treatment for patients with pulmonary hydatid disease. Complicated cases have higher rates of preoperative and postoperative complications and require longer hospitalization time and more extensive surgical procedures than uncomplicated cases. This underlines the need for immediate surgery in any patient who is diagnosed with pulmonary hydatidosis when it is indicated.

Keywords: Hydatid cyst complicated; Lung; Surgery

INTRODUCTION

Hydatid disease is a parasitic infection caused by *Echinococcus granulosus*^[1]. The cyst lodges most commonly in the liver and the lung, respectively. Morphologically, hydatid cyst consists of three layers and hydatid fluid. The first layer is the pericyst or adventitia which is the host tissue formed by the lung as a reaction to the foreign body (parasite). The other two layers, the laminated membrane (external layer of the cyst) and the germinative layer (inner

layer of the cyst), belong to the parasite. The cyst fluid resembles water in appearance which may contain daughter vesicles^[2].

Hydatid disease is endemic in some countries, particularly where sheep and cattle are raised, such as Australia, New Zealand, the Mediterranean countries, the Middle East, and South America. In Iraq, where the incidence of hydatid disease is reported to be 80/1 000 000, it is particularly common in the rural population. After the liver, the lung is the second most common site for hydatid cysts in adults^[3].

Pulmonary hydatids vary from 1 cm in diameter to an enormous cyst of 20 cm or more, obliterating an entire lung and displacing the heart and mediastinum to the opposite side. Cysts may cause sufficient

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compression to cause death from asphyxia^[3].

MATERIALS AND METHODS

The medical records for 89 patients of complicated pulmonary hydatidosis (94 complicated cysts) were retrospectively investigated.

In this study, we reported our 8-year experience with complicated hydatid cysts of the lung. The clinical files of 246 patients who had undergone operations for hydatid disease of the lung in our clinic from January 2000 to December 2007 were reviewed among these patients, 89 (36%) had complicated cysts. The group consisted of 47 male and 42 female patients with a mean age of 32 ± 8 years. Ages ranging from 7 to 67 years.

Patients with hydatid cysts of the lung who have perforated cysts or cysts complicated by infection, calcification, or pleural involvement, are included in a special clinical entity called "complicated hydatid cysts". Thus the term "complicated" does not necessarily indicate an infected cyst.

Preoperative evaluation was done by means of physical examination, hematological and biochemical investigations, chest X-ray. We did not routinely perform computed tomography of the chest and of the upper-abdomen (CT) and fiberoptic bronchoscopy was preoperatively done if an endobronchial lesion or other indication was suspected. Additional investigations such as Casoni's intradermal test, or specific anti-echinococcus IgE were also performed.

Casoni's intradermal test, Weinberg complement fixation test, and eosinophil count for diagnosis we did not routinely perform because their diagnostic values are suboptimal. A diagnosis of complicated hydatid cyst was made based on chest X-ray, CT and medical history.

Operative techniques

All procedures were performed under general anesthesia with single or double-lumen endotracheal tube. Thoracotomy through the fifth or sixth intercostal space was accomplished. The surgical wound and adjacent tissue was covered with packed gauzes soaked in 1% povidone-iodine so that only the area of the lung containing the cyst was exposed. In pa-

tients with perforated and infected complicated cysts, after removal of remnants of germinative membranes and laminated membranes, the residual cavity was carefully cleaned and re-examined for spillage of daughter vesicles. The cystic cavity was cleaned by suction and irrigated with 1% povidone-iodine in all patients. Cystotomy plus, the obliteration of the cyst cavity made by circumferential imbricating separated sutures with 3-0 chromic catgut or a 3-0 coated polyglactin from within the cavity, were performed in these patients (capitonnage) though recently cystotomy plus closure of bronchial openings technique in perforated hydatid cysts are being performed. Bronchial openings were closed with a 3-0 polyglactin. Decortication was performed in patients with pleural complications.

There were 3 patients who underwent resections (one left lower lobectomy, two right lower lobectomies) due to a destroyed lobe. In all patients, either a 32F or 28F chest tube was positioned posteriorly and anteriorly. During the postoperative period, chest tubes were placed on 20-25 cm H₂O suction and were removed when no air leak was evident and when the drainage was less than 50 mL in 24 hours. A right thoracophrenotomy was performed in 11 cases with concomitant liver hydatid cysts.

The principal of the resection of liver cyst was differing the pulmonary cyst; there are important technical differences between the two operations; since the hepatic cysts contain daughter vesicles more commonly than the pulmonary cysts^[4]. For this reason, we used a scolecidal agent hypertonic saline solution or 10% povidone iodine injected through the diaphragm into the cyst to prevent the spreading of the living vesicles in the abdomen or thorax before the opening and removal of the cyst. The diaphragm was cut using a scissors and its muscle is separated from the cyst by blunt and sharp dissections with no pressure over the cyst. When the intracystic pressure has been lowered, the cyst was opened from the uppermost part of the cyst and its content was aspirated by a large holed suction device.

Because the cyst contains numerous daughter vesicles that are not technically possible to aspirate with a suction device or take out by a grasper, a spoon was used to evacuate the cavity completely.

In 29 patients (32.5%) with the high possibility of recurrence were given albendazole in a dosage of 10 mg/kg as a postoperative prophylactic measure to prevent recurrence in patients that have undergone nonradical resection because of technical reasons.

Treatment was given as 3 sequential 28-day courses, with 2 weeks intervals between courses and continued for twelve months.

RESULTS

The main complaint of the patients at presentation was nonproductive cough. Some of the patients with centrally located cysts complained of blood-streaked sputum and others of a dull ache in the chest. Hydatoptysis, the only pathognomonic symptom of pulmonary hydatid disease was observed in 4 patients (4.4%). Fifteen patients (16.8%) described a salty taste in mouth after vomit-like expectoration of a colorless fluid that was an important indication of a perforated pulmonary hydatid cyst. Allergic reactions were not observed in any of the patients.

Uncomplicated cysts were seen as round opaque lesions on chest radiography (Figure 1). The most common findings in the chest X-ray films of patients with complicated cysts were the presence of an air-fluid level or the presence of air between the two layers of the cystic wall (Figure 2, 3, and 4). The findings were noted in 71 patients (79.7%). A pneumothorax occurred in 3 patients (3.3%). Once the suppuration occurred following perforation, contrast enhancement of the cyst wall and an increase of the fluid density (>20 Hounsfield units) within the cyst were seen in 15 patients (16.8%) on CT (Figure 5).

43 of the complicated cysts were located in the right lung and 41 in the left lung (Table 1). Eight cases had concomitant liver hydatid cysts (8.98%). Cystotomy plus capitonnage were the most frequently used operative technique ($n = 43$), followed by cystotomy plus closure of bronchial openings ($n = 28$), pericystectomy plus capitonnage ($n = 13$), decortication ($n = 7$), lobectomy and segmentectomy ($n = 3$) (Table 2). There was no emergency procedure.

The mortality rate was 6.7% and early postoperative complication rate was 13.4% (12 patients: 2 hemorrhage, 3 prolonged air leak, and 7 patients with atelectasis and associated pneumonia). Two patients were reoperated for hemorrhage. The remaining patients were treated conservatively. Prolonged parenchymal air leak (>7 days) was managed by continuous negative suction and chest physiotherapy until the lung was fully expanded (Table 3).

Follow-up: Twenty one patients (23.5%) were lost to follow-up. All of the remaining patients were followed for periods varying from 6 months to 5 years. Median follow-up period was 48 months. While there was no recurrence in the patients who received chemoprophylaxis, recurrences developed in 6 patients (6.7%) who had not received chemoprophylaxis. Recurrences were observed with disseminated pleural hydatidosis in 6 patients 6 and 12 months after the operation. In all of recurrences patients, the recurrence site was in a different lobe but on the same side as the original cyst. All recurrence patients had a second thoracotomy.



Figure 1 Large solitary non-complicated hydatid cyst of the right lung, solitary, well-circumscribed, homogeneous mass. Usually round but may be oval, elliptical or lobulated in contour. There is umbilication or notching along the medial and posterior borders of this hydatid (arrows) caused by pressure on the cyst from adjacent vessels or bronchi.

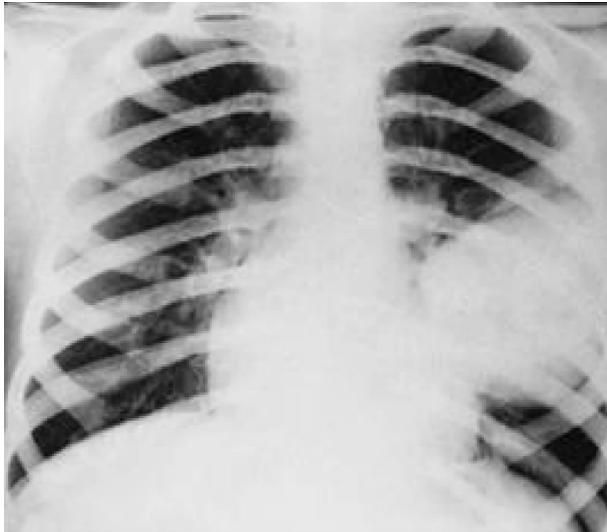


Figure 2 Chest X-ray image of complicated hydatid cyst with pleural complication.



Figure 3 Chest X-ray image of complicated hydatid cyst (infected cyst with abscess formation). (Note the thick wall).

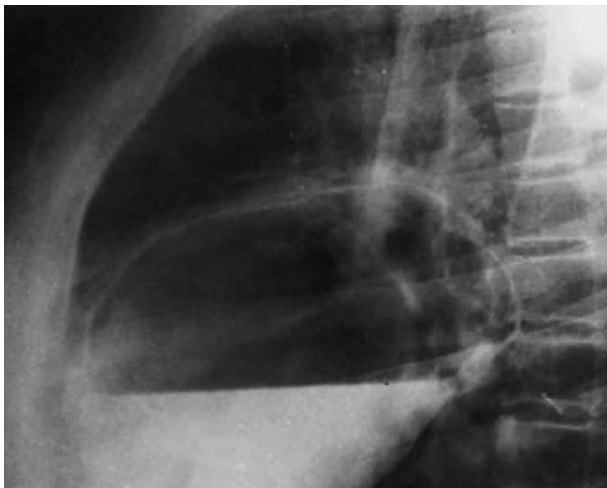


Figure 4 Air-fluid levels in ruptured hydatid cysts in patient with cough and expectoration. Lateral view of the chest of the patient shows a huge ruptured hydatid cyst occupying the entire right middle lobe. The fluid level in this cyst is smooth, as might be seen in an infected nonparasitic cyst or abscess

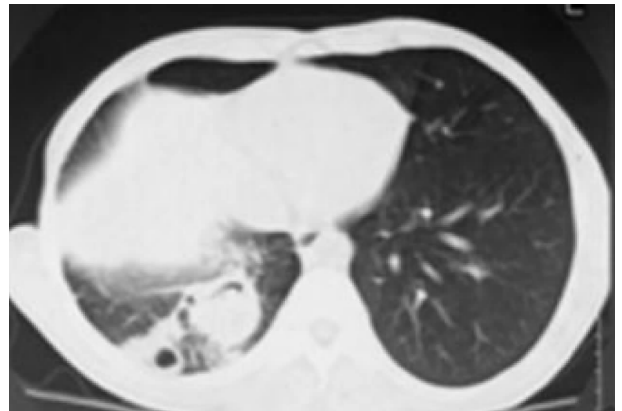


Figure 5 Two ruptured cysts located in the right lower lobe of the lung. The fluid of the smaller one is completely expectorated while the larger cyst seems still having the fluid. Partial or complete expectoration of the fluid after cyst rupture is completely related to the presence or absence of an open bronchiole adjacent to the cyst

Table 1 Location of complicated hydatid cysts in 89 patients.

Location	Total	Lower lobe	Middle lobe	Upper lobe	%
Right lung	18	9	26	53	56
Left lung	19	0	22	41	44
Total	37	9	48	94	100

Table 2 Surgical data for 89 patients.

Operative method *	Condition of cyst			No. of operations
	Perforated	Infected	Pleural complication	
Cy stotomy + capitonage	21	13	9	43
Cystotomy + closure of bronchial openings	25	3	0	28
Pericystectomy + capitonage	9	4	0	13
Decortication	0	4	3	7
Resection(lob > seg)	0	3	0	3
Total	55	27	12	94

* The obliteration (capitonage) is made by circumferential imbricating separated sutures with 3-0 chromic catgut or a 3-0 coated polyglactin from within the cavity.

Table 3 Postoperative complications and operative techniques.

Complications	No. of patients	%	Operative technique
Hemorrhage	2	2.20	Pericystectomy + capitonage
Prolonged air leak (>7 days)	3	3.35	Cystotomy + capitonage
Atelectasis	7	7.85	Cystotomy + capitonage

DISCUSSION

Surgery continues to be the treatment of choice in pulmonary hydatid disease. The aim of surgery in complicated pulmonary hydatid cyst is to remove the cyst completely if possible while preserving the lung tissue as much as possible^[2,3,5,6]. Lung resection is performed only if there is an irreversible and disseminated pulmonary destruction. Careful manipulation of the cyst and precaution to avoid the contamination of the operative field with the cyst content is the imperative part of the operation. The cysts located on the liver dome are easily accessible and resected via thoracotomy with the transdiaphragmatic approach^[5,7].

Diagnosis of pulmonary hydatid cysts was based on clinical and wide range of radiological findings^[6]. Infection and perforation changed the radiographic appearance of hydatid cyst, which lead to an incorrect diagnosis and delayed treatment in 22 (24.7%) of patients. Although infected cysts are usually associated with perforation, this is not generally true and in 5 (5.6%) of patients ruptured cysts remained uninfected^[4,7]. Computed tomography (CT) was helpful in establishing the diagnosis in 85% of cases^[8].

Several clinical laboratory studies including fiberoptic bronchoscopy, Casoni's intradermal test, and the indirect hemagglutination test were useful in the diagnosis, but was not reliable for reported sensitivity rates vary significantly^[9,10,11]. Albendazole

was used in 29 (32.5%) patients that have undergone nonradical resection so that the use of albendazole^[11,14] in selected patients decreases the recurrence rate. Fortunately we had no recurrence among this group of patients.

In this study various surgical procedures had been used in the treatment, namely, excision of the entire cyst by enucleation (Barret technique), excision of pericyst (Perez Fontana), cystotomy, capitonage, wedge resection, segmentectomy, and lobectomy^[2,7]. The choice of surgical technique was depended on the conditions encountered during surgery. As a rule, the lung parenchyma was preserved as much as possible in patients with pulmonary hydatid disease^[13]. However, if bronchiectasis or severe inflammation was present, the affected lungs were excised. Lung resection was carried out in 3 (3.2%) of our patients with infected cysts.

In our series, we tried to avoid lung resection in treatment of the infected cyst as much as possible and we believe this policy has contributed to the accepted successful outcome in our patients. For this reason, we have concluded that parenchyma resection should not be the first choice for the treatment of an infected hydatid cyst. Decortication was performed in 5 patients (5.4%), because of the pleural thickening. Conservative surgical techniques, such as cystotomy plus capitonage constituted the routine surgical approach in our clinic. But, recently, we started to perform cystotomy plus closure of bronchial openings technique. While conservative



surgical technique such as capitonnage is widely performed for the management of the residual cystic space, it can cause atelectasis by obliterating the bronchus surrounding the cyst or the residual cavity may not be obliterated completely by this procedure. Especially in patients with perforated cysts, postoperative complication rates can be lowered by the application of the cystotomy plus closure of bronchial openings technique.

Twelve patients (13.4%) in this series with complicated lung hydatid cysts also had cysts in the liver, approached through a right thoracophrenotomy, in 6 patients the cyst was located on the upper surface of the liver, 4 located in the upper and posterior part of the right lobe of the liver, and 2 penetrating through the diaphragm into the pleura.

Postoperative complication rate was 13.4% (12) compared with other similar studies done in Western countries and Newzeland which was reported to be 1.5% and 2% respectively in the complicated cysts^[3,5,11-14]. The most common postoperative complications were hemorrhage, prolonged air-leak, empyema, pneumonia and atelectasis due to the aspiration of cystic content or washing solution through an open bronchus adjacent to the cyst we faced (Table 3).

The mortality rate was 6.7% (6) compared with other similar studies done in Western countries and Newzeland which were less than 2% in the complicated cysts, this high difference in morbidity and mortality in this study is probably because of delayed diagnosis and less facilities for postoperative care as well as the bigger the size of the cyst in this country and was found as an important factor in the increased complication rate^[3,5,11,12].

Pulmonary resection (i. e., lobectomy) was necessary in 3.3% of the patients when there was severe lung destruction and fibrosis which is similar to other similar studies done elsewhere.

In conclusion, CT scans of the chest and upper abdomen are helpful for diagnosis and for selection of the appropriate surgical approach in patients with complicated hydatid cyst of the lung. Conservative surgical procedures should be used as first choice. The lung parenchyma should be preserved as much as possible. In patients with coexisting liver cysts, thoracotomy accompanied by transdiaphragmatic approach is preferable. An appropriate surgical approach results in low complication and recurrence rates.

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