OUTCOME OF CAPITONNAGE IN MANAGEMENT OF PULMONARY HYDATIDOSIS

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ABSTRACT

Background

Pulmonary hydatidosis is an endemic disease in Iraq. The treatment of choice for pulmonary hydatid disease (PHD) is surgical. The the aims of surgery are evacuation of cyst contents, closure of bronchial openings, and prevention of intra-operative soiling. The management of residual cyst cavity is controversial and the majority of surgeon recommend leaving the cavity open. However, others prefer to close it by capitonnage.

Objectives

The objective of this study was to assess the outcome and safety of capitonnage in surgery of pulmonary hydatid cyst and comparing our results with the relevant literature.

Patients and Methods

Seventy two patients with diagnosis of PHD (simple or complicated) admitted to our institution from November, 1st 2010 to July, 1st 2013. The demographic and clinical features were recorded. Diagnostic work-up was clinical, plain chest X-rays aided by CT scan of the chest and bronchoscopy in doubtful cases. Serological tests were not done routinely. In all patients the residual cavity of the cyst was closed by capitonnage using a series of purse-string Vicryl sutures from the bottom outwards.

Results

The cysts were intact in 38 patients (52.17%) and ruptured in the remaining 34 (47.83%). lung parenchyma preserving techniques were used in all patients except one (1.4%) who had lobectomy. All patients run a smooth postoperative course except five (6.9%) who developed prolonged air leak (n=1), empyema (n=2), empyema and pneumothorax (n=1) and one case of recurrence (1.4%). There was no mortality.

Conclusions

The results of capitonnage procedure in this series were superior to studies in which the cyst cavity was left open with lower complication and reoperation rates.

Keywords: PHD, Echinococcosis, Lung preserving surgery, Capitonnage, Morbidity.

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INTRODUCTION

Hydatid disease (Echinococcosis or Hydatidosis) is usually caused by the tapeworm *Echinococcus granulosus* and rarely by *Echinococcus multilocularis*. The disease is one of oldest recorded diseases in humans dating back to the time of Hippocrates and Galen and was described by Thebesius in the 17th century [1, 2] Following the liver, lung is the second most frequently affected organ (10–40%). Extrapulmonary but intrathoracic (EPIT) location of the disease (Mediastinal, pericardial, myocardial, interlobar pulmonary fissure, and pleural locations) is rare [3-6]. Incidence in Iraq is between 1/20,000 and 1/50,000 per annum and it is particularly common in rural areas [3-7].

Pulmonary hydatid disease appears to be more common in younger individuals because of their frequent encounter with infected animals [1-3]. Although most patients are asymptomatic, some may occasionally expectorate the contents of the cyst or develop symptoms related to compression of the surrounding structures. Other symptoms of hydatid disease result from the release of antigenic material and secondary immunological reactions that develop from cyst rupture. The cysts are characteristically seen as solitary or multiple circumscribed or oval masses on imaging. Detection of antibody directed against specific echinococcal antigens is found in approximately 50% of patients with pulmonary cysts only [4, 5, 6] .

Surgery remains the treatment of choice for pulmonary hydatid disease. The primary objective is to evacuate the endocyst and hydatid fluid along with daughter cysts, if present and to obliterate the bronchial openings within cyst wall [7-8]. Additionally, obliteration of the residual cavity along with pericyst (capitonnage) has long been the practice to avoid postoperative air leak and empyema formation [2, 8]. However, this practice continued over the years without any convincing statistical evidence since its introduction in 1951 [9]. Recently, Eren et al. Turna et al and Erdogan et al. challenged this hypothesis suggesting that capitonnage did not offer any additional benefit over cystotomy and bronchial opening closure alone [2, 9].

These retrospective and prospective findings were convincing and attracted many investigators, as it avoided the disfigurement of lung parenchyma by capitonnage. Interestingly, these findings could not be reproduced by Kosar and Bilgin et al. and they still believe that capitonnage has additional advantage and is associated with better postoperative outcome [10-12].

Herein we report our single center experience of 72 patients with pulmonary hydatid cyst managed by capitonnage to clarify its role in the management of this endemic disease in Iraq.

PATIENTS AND METHODS

Seventy two patients (36 males and 36 females) with a diagnosis of PHD (simple or complicated) admitted to the Department of Thoracic Surgery in Sulaimani teaching hospital during the period from November, 1st 2010 to July, 1st 2013 were included in the study. All patients were managed by the authors.

Diagnosis was based mainly on clinical grounds and plain chest (PA and Lateral) radiography aided by CT scan of the chest and bronchoscopy in doubtful cases. Abdominal ultrasonography was done to patients with right lower lobe HC to discover associated hepatic cysts which sometimes can be removed at the same operation. Serological tests were not done routinely.

General assessment of all patients were done by physicians and anesthesiologists. Prophylactic antibiotics were used routinely (Ceftriaxone 1 gram intravenously) 30 minutes before induction, and was continued until the patient discharged home.

All patients were operated upon using general anesthesia. A posterolateral thoracotomy (mostly muscle sparing) through the fifth or sixth intercostals space in lateral position was used in most patients while some cases had bilateral anterolateral thoracotomies in supine position.

After entering the pleural cavity, the lung was freed from all adhesions to the chest wall. After identification of the cyst, the operative field and pleura were covered with packs soaked with diluted 10% Povidone-iodine solution to prevent seeding. The cysts and their contents were removed by aspiration and evacuation method through a large suction apparatus inserted into the cyst. No antiscolicidal agent was used. The most prominent part of the cyst was opened with scissors or electrocautery (cystostomy), and the cyst membrane was removed with sponge forceps (cystectomy) Fibrotic lung tissue was excised (percystectomy).Then the residual cavity was irrigated with 10% Povidone-

iodine solution and was cleaned with the suction apparatus. After closure of bronchial openings, the residual cavities were obliterated with separate purse-string sutures starting from the bottom of the cavity outwards (capitonnage) using absorbable number 0 polyglactin 910 sutures (Vicryl; Ethicon, Edinburgh, Scotland). One chest tube was inserted into the pleural space, and the chest tube was removed when air leak ceased and when the drainage was less than 100 mL/24 hours. The postoperative course was monitored looking particularly for amount and duration of air leak, time of chest tube removal, rate of empyaema, the need for additional chest tube and length of hospitalization. All patients received anti-parasitic drugs started postoperatively in the form of oral Albendazole tablet in appropriate dose(15 mg/kg), and continued for up to 16 weeks. Following discharge of patients home, the patients were followed up by the specialist surgeon in a private clinic. Complications like hemoptysis, lung abscess, recurrent pneumothorax were noted. In this study, we considered air leak lasting more than seven days postoperatively as a prolonged air leak and the duration of follow up was 4-24 months.

RESULTS

Age and gender of patients, side and type of operation

The total number of patients in this study was 72 (36 males and 36 females). The male to female ratio was 1:1. The age range was 5 to 45 years. The mean age was 23.87. The total number of cysts was 79 (seven patients had 2 cysts each). Most of the patients had a unilateral disease (65, 90.3%) while the remaining 7 patients (9.7%) had a bilateral disease.

The right side was involved in 40 patients (50.6%) and the left side was involved in 32 patients (49.4%). The cysts were intact in 38 patients (48.1%) and ruptured in the remaining 41 (51.9%)

The characteristics of patients and their cysts are shown in Table 1.

Table 2: Lobar distribution of cysts. The most frequently involved lobe was the left lower lobe while the least was the right upper lobe.

Table 3: Displays the clinical presentations. About one fifth (21.5%) of patients were asymptomatic while chronic cough and chest infection were the predominant clinical presentations.

Table 1. Characteristics of patients and cysts.

Total number	72
Gender, Males n (%): Females n (%)	Males 36 (50): Females 36 (50)
Age average and mean	5-45 years, 23.87
Total number of cysts	79
Intact vs. Ruptured n (%)	38 (48.1), 41 (51.9)
Unilateral vs. Bilateral n (%)	65 (90.3), 7 (9.7)
Right sided vs. Left side n (%)	40 (50.6), 32 (49.4)

Table 2. Lobar distribution of cysts.

Lobe	Cyst n (%)
Left lower	22 (27.8)
Right middle	19 (24.1)
Left upper	17 (21.5)
Right lower	13 (16.5)
Right upper	8 (10.1)
Total	79 (100)

Table 3. Clinical presentation.

Clinical Presentation	Frequency, n (%)
Chronic cough	18 (22.8)
Asymptomatic	17 (21.5)
Chest infection	17 (21.5)
SOB	8 (10.1)
Tension pneumothorax	6 (7.6)
Hemoptysis	5 (6.3)
Right hypochondrial pain	5 (6.3)
Chest pain	2 (2.5)
Left upper abdominal pain	1 (1.3)
Total	79 (100)

SOB: Shortness of breath

Table 4 shows the distribution of patients in relation to gender and side. The operations seemed to be equally divided between right and left sides. Females had more operations on left side while males had more operations on right side. Seven patients (6 males and 1 female) had bilateral operations.

The duration of chest tube removal is shown in Table 5. Most of the patients (76%) had chest tube removal within 48 hours after operation. One patient (1.3%) had prolonged air leak and his chest tube was removed after 14 days.

The duration of hospitalization varied from 2 days to 1 week except for 1 patient who stayed for 2 weeks as shown in Table 6.

Chemotherapy was given to all patients in this study for a duration ranging from 1 to 4 months as shown in Table 7.

Table 8 shows the complications. Most of the patients (93.7%) run a smooth postoperative course. There were only 5 complications.

Table 4. Gender vs. side of operation.

Gender	Right, n (%)	Left, n (%)	Bilateral, n (%)	Total, n (%)
Males	19 (26.4)	11 (15.3)	6 (8.3)	36 (50)
Females	14 (19.4)	21 (29.2)	1 (1.4)	36 (50)
Total	33 (45.8)	32 (44.5)	7 (9.7)	72 (100)

Table 5. Gender vs. Chest tube removal time in days after 79 operations.

		2 days No (%)	3 days No (%)	4 days No (%)	5 days No (%)	6 days No (%)	14 days No (%)	Total No (%)
Gender	**Male**	33(41.8)	4(5.1)	3(3.8)	0 (0)	1(1.3)	1(1.3)	42 (53.2)
	Female	27(34.2)	4(5.1)	4(5.1)	2(2.5)	0 (0)	0 (0)	37 (46.8)
Total		60(76)	8(10.2)	7(8.9)	2(2.5)	1(1.3)	1(1.3)	79 (100)

Table 6. Duration of stay in hospital.

Duration in days	Patient n, (%)
2 to 3 days	54 (75)
4 to 5 days	14 (19.4)
6 to 7 days	3 (4.2)
More than 8 days	1 (1.4)
Total	72 (100)

Table 7. Chemotherapy duration.

Duration of chemotherapy	Patient n, (%)
1 to 2 months	22 (30.6)
3 to 4 months	50 (69.4)
Total	72 (100)

Table 8. Complication.

Complication	Number (%)
Postoperative Empyema	2 (2.5)
Empyema and Pneumothorax	1 (1.3)
Prolonged Air Leak	1 (1.3)
No Complication	74 (93.7)
Recurrence	1 (1.3)
Total	79 (100)

DISCUSSION

Surgery remains the treatment of choice for PHC. The principles of surgery for PHC traditionally included evacuation of the cyst contents, prevention of cyst rupture at the operative site, closure of bronchial fistulae and management of the residual cavity [1, 4]. Cystotomy with or without capitonnage is the most widely performed surgical procedure for the hydatid disease.

One of the important considerations after pulmonary hydatid cyst surgery is the prolonged air leak. The desire of every surgeon following this type of surgery is to have no or minimal air leak, early and full lung expansion and quick chest tube removal [13, 14].

Prolonged air leak entails longer stay of patient in the hospital, failure of the lung to expand completely and increased likelihood of empyaema as well as sometimes the need for re-operation [15, 16].

The usual definition of prolonged air leak is persistent drainage of air via the chest tube after two postoperative weeks. However, there is no general agreement about this definition. Different studies reported prolonged air leak as persistent leak of air 4 to 14 days after operation [12,14,17].

The pathogenesis of this potential complication of PHC surgery is multifold. Big cysts with deeply seated bronchial openings are a common cause beside the ruptured and infected cysts in which the sutures may cut through [12,15,17]. The most important factor, however, is the surgeon who does not give the necessary time, attention and effort to identify and meticulously close all significant bronchial fistulae.

Regarding whether there is any role the way the surgeon manages the residual cyst cavity with the causation of prolonged air leak? This answer is difficult.

There are two methods for management of the residual cyst cavity. The first one is capitonnage, that is closure of the cavity after removing its contents with a series of purse string sutures from the bottom outwards and the second is cystotomy and closure of bronchial orifices leaving the cavity open. Which option is better is also very controversial issue [12,14,17].

A study by Saidi et al. about two decades ago recommended leaving the residual cavity open with intention for the pulmonary parenchyma to automatically obliterate itself, without a compromise to functional lung volume [8,11]. Later studies by Turna et al and Erdogan et al also suggested that capitonnage was not a necessary step in management of residual cavity [9].

Delbet was the first one who described capitonnage method in the surgical treatment of pulmonary hydatid cyst [7]. Obliteration of the residual cavity along with pericyst (capitonnage) has long been the practice to avoid postoperative air leak and empyema formation [2, 8]. However, this practice continued over the years without any convincing statistical evidence since its introduction in 1951[9]. Recently, Eren et al., Turna et al. and Erdogan et al. challenged this hypothesis suggesting that capitonnage did not offer any additional benefit over cystotomy and bronchial opening closurealone [2, 9]. These retrospective and prospective findings were convincing and attracted many investigators , as it avoided the disfigurement of lung parenchyma by capitonnage. Interestingly, these findings could not be reproduced by Kosar and

Bilgin et al. and they still believe that capitonnage has additional advantage and is associated with a better postoperative outcome [10-12]. The proponents of capitonnage argue that prolonged air leak can be avoided or minimized by their technique as well as other complications like postoperative empyaema [12,18,19]. In contrast, the proponents of leaving the cavity open believe that the most important step to avoid the prolonged air leak postoperatively is the meticulous closure of all significant bronchial openings and capitonnage is not necessary. The natural course of the cavity is to get gradually shallower with lung expansion. They also believe that capitonnage causes lung disfigurement, prolongs the operative time and increase morbidity [11-13,18,19] by a further trauma to lung parenchyma resulting from inserting the purse string sutures which themselves can act as foreign materials predisposing to lung abscess development and postoperative hemoptysis.

To solve this controversy we need a double-blind comparative study on large number of patients. The patients should be divided into two groups, one to receive capitonnage while the second is managed by cystotomy and bronchial fistulae closure. The two groups should be homogenous in their characteristics such as age (children or adults), type of cysts (intact or ruptured), size of cysts (small or big), location and number of cysts (single or multiple). The postoperative parameters which need monitoring should be specified like prolonged air leak, time of chest tube removal, rate of empyema, the duration of stay in the hospital and the need for re-operation.

We think that comparing one study with another one is not helpful and valid unless both studies agree upon the same definition of prolonged air leak and have homogenous characteristics as mentioned before.

Kosar et al. from Turkey published a classical study on outcome of capitonnage in paediatric PHC. In this retrospective study all children (n=60) received cystotomy and closure of bronchial openings. The patients were divided into 2 groups. In the first group the residual cavity was closed by means of capitonnage while cystotomy was applied in the second group. There was no mortality in either group. The authors concluded that capitonnage was superior to cystotomy because it reduced morbidity (especially prolonged air leak) and hospital stay [12].

In contrast, Erdogan et al conducted a comparative study on two groups of patients with PHC who were comparable with regards to their clinical, operative and demographic characteristics. Each group consisted of 45 patients. One group was managed by capitonnage while the second was not. There was no mortality, and no significant difference in hospitalization time between the two groups. The complications in both groups were minimum (bronchopleural fistula n=1, prolonged air leak n=5 and empyema n=1). These results were not valuable statistically. Thus authors concluded that it is not an advantage to carry out capitonnage when treating pulmonary hydatid cysts [10].

Shehatha et al. studied 763 cases of thoracic hydatidosis from Iraq. All patients were managed surgically leaving the remaining cavity open after securing localized air leaks. Mortality was 1% and morbidity was 12.6%. The authors considered lung preservation without obliterating the pericystic cavity provided good results in uncomplicated cysts [5].

Review of relevant literature reveals studies from different countries of conflicting conclusions, some quote lower complication rate with the first technique while others find the second technique more advantageous. Further studies find equivocal results. The present study reports superior short term results of capitonnage over other technique like early postoperative air leak cessation, shorter duration of hospitalization and lower rate of postoperative empyaema.

Management of the bronchial openings is of major importance in surgery for PHC in order to minimize postoperative air leak. The optimum management of the residual cyst cavity is controversial issue; some prefer to leave the cavity open while others advocate its closure (capitonnage). This study revealed a low complication rate following capitonnage, a result similarly reported by other studies. Therefore, we think that capitonnage could be a preferred technique in management of PHC.

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