

Surgical Procedures and Postoperative Complications in Patients with Giant and Non-giant Pulmonary Hydatid Cysts

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Abstract: There is a challenge over treatment of giant pulmonary hydatid cysts. Therefore, we aimed at comparing the surgical procedures and postoperative complications between patients with giant and non-giant hydatid cysts. In a retrospective clinical study, patients operated for hydatid lung cysts were divided into giant pulmonary hydatid cysts (size>10 cm) and non-giant hydatid cysts groups. Patients were treated surgically using lung preservation (capitonnage, uncapitonnage and segmentectomy) and lobectomy procedures. A total of 612 patients, 59 (9.6%) in the giant and 553 (90.4%) in the non-giant pulmonary hydatid cysts, were recruited. The most common symptoms in the giant group were cough (100%) and dyspnea (71.2%). These symptoms along with the systemic symptoms and ruptured hydatid cysts were more observed in the giant group ($P<0.001$). The lung preservation procedures and cyst delivery were more performed in the non-giant group ($P<0.001$), while lobectomy, needle aspiration and bronchial opening closure procedures were more applied to the giant group ($P<0.05$). The postoperative pulmonary complications, excluding empyema and anaphylaxis, were more observed in the non-giant group ($P<0.001$). The patients undergoing the surgery of giant pulmonary hydatid cysts, using lobectomy in comparison with the lung preserving procedures experience lesser postoperative pulmonary complications and total length of hospitalization. [Sokouti M, Pezeshkian M, Ghabili K, Golzari SE. **Surgical Procedures and Postoperative Complications in Patients with Giant and Non-giant Pulmonary Hydatid Cysts.** *Life Sci J* 2013;10(1):138-142] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 20

Keywords: Giant hydatid cyst; lung; parenchymal preservation; lobectomy

1. Introduction

Hydatid disease is a worldwide zoonosis caused by larval stage of *Echinococcus*. It has two main types; *Echinococcus granulosus* and *Echinococcus multilocularis*. The tapeworms of parasite with 6 mm length living in the small bowel of carnivores, especially dogs release eggs via feces. Humans are considered as an incidental intermediate host. Chitinous eggs are lysed in the proximal digestive tract releasing six larvae which would ultimately reach the liver via portal venous system and rarely the heart via thoracic lymphatic duct. In the liver, larvae can pass through sinusoids, suprahepatic veins and right chambers of the heart and eventually reside the lungs. In the parenchyma of the liver and the lungs, the larvae could growth and produce hydatid cysts (Pedrosa et al., 2000; Sokouti et al., 2010). Echinococcosis, hydatid disease, is considered a disease endemic to Northwest Iran likewise other endemic areas (Mediterranean countries, Middle East, South America, Australia and New Zealand). Pulmonary hydatid cysts are reported to have an incidence of 14-27% with a peak in the 3rd and 5th decades of life (Topçu et al., 2000; Karaoglanoglu et al., 2001; Usluer et al., 2010). Lungs are the second most common affected sites

after liver. Giant pulmonary hydatid cysts, an uncommon manifestation of pulmonary hydatid cysts, usually complicate the clinical presentation, treatment and postoperative complications (Dakak et al., 2009; Ekim et al., 2009). Investigations carried out on giant pulmonary hydatid cysts seem to be few; yet there is a challenge present over their treatment in the literature. This retrospective clinical study aimed at comparing the surgical procedures and postoperative complications between patients with giant and non-giant hydatid cysts.

2. Material and Methods

This retrospective clinical study was carried out on patients who were operated for hydatid lung cysts in our referral hospital from 1993 to 2009. The study was approved by the Medical Ethics Committee of Tabriz University of Medical Sciences. Of 612 patients, 59 (9.6%) patients were diagnosed with giant pulmonary hydatid cysts (giant group), and the remaining 553 (90.4%) patients were categorized in non-giant group. Giant hydatid cyst is defined the cyst has more than 10 cm size and sizes less than 10 cm related to non-giant pulmonary hydatid cyst. In this study the sizes of giant hydatid cysts varied from 10 to 35 cm. In the giant group, 58 patients were

admitted with relatively stable conditions while one patient, a 10-year-old girl, was admitted as an emergency case diagnosed with tension pneumothorax and massive hemoptysis and other complicated patients shown in Table 2 were admitted with no emergency conditions. Chest X-ray, computed tomography (CT) scan were performed preoperatively. Due to lack of inadequate data, pulmonary function tests (PFT) were not used. Recovery of the patients was achieved by estimated recovery of clinical signs and chest X-ray or CT scan. Laboratory tests including Casoni and Weinberg tests were not routinely performed due to their low sensitivity. Patients of two groups were treated surgically using lung preservation (capitonnage, uncapitonnage and segmentectomy) and lobectomy procedures. Symptoms on admission, incidence of postoperative pulmonary complications, mortality and morbidity were compared between the two groups.

Preoperative evaluations included: (1) Uncomplicated non-giant pulmonary hydatid cyst patients were prepared for any type of thoracotomy especially standard posterolateral thoracotomy, enucleation of the cyst and lung preservation procedures such as capitonnage; (2) Complicated non-giant pulmonary hydatid cyst patients (abscess, rupturing) were prepared for any type of thoracotomy, extraction of the cyst, closure of the bronchial openings, lung preservation procedures or uncapitonnage procedures; (3) For patients with complicated or uncomplicated giant pulmonary hydatid cysts with destruction of more than 70% of the lobe lobectomy was selected; and (4) In 24% of the patients that lung parenchymal procedures were selected in the surgery of giant pulmonary hydatid cysts, second thoracotomy with resection of the collapsed, non-functional residual lobe was selected.

Standard classic posterolateral and rarely anterolateral thoracotomy were used in giant lung hydatid cysts. All patients underwent general anesthesia. Double lumen tubes were used in order to avoid any possible spillage of giant cyst contents into the contralateral bronchus. Later, correct position was confirmed by fiber optic bronchoscopy. In the anterior and middle lobe cysts, anterolateral thoracotomy incisions were selected while in others posterolateral thoracotomy was administered. After entering the involved hemithorax, the cysts were identified and surrounded by povidone-iodine 5% and later irrigated abdominal lap to prevent seeding of possible ruptured laminated membrane. In two patients pericyst wall was opened and the laminated membrane was delivered and enucleated while positive intrapulmonary pressure was being applied (Figure 1). Aspiration and evacuation of intact cysts

were performed on the remaining hydatid cysts (greater than 10 cm). In some rare cases of our study, parenchymal saving procedures were performed by closing bronchial openings with polyglactin 3/0, coated vicryl Ethicon and capitonnage or non-capitonnage procedures. In parenchyma saving procedure techniques, classic or unclassic segmentectomy were also performed.

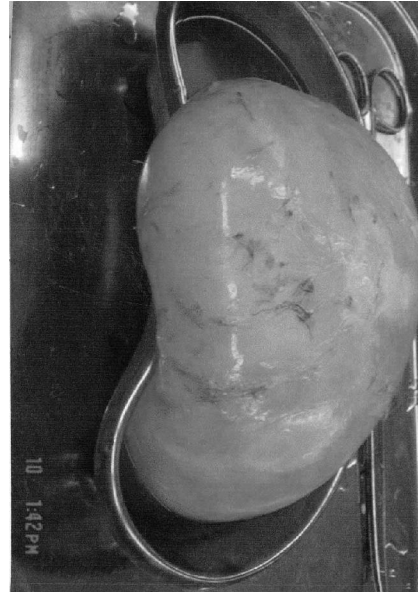


Figure 1. An intact giant pulmonary hydatid cyst (18×10×10 cm) after enucleation

In the uncapitonnage procedure, the cavities were left open after closure of bronchial openings. In capitonnage procedure, however, the cavities were obliterated by imbricating sutures from deep to superficial layers (Sokouti et al., 2011). In most patients, classic lobectomy was selected because of the tremendous destruction present in the affected pulmonary lobes. In other words, the present study adopted these criteria for lobectomy: severe hemorrhage with ruptured hydatid cysts, giant pulmonary hydatid cysts destroying more than 50% of a lobe, severe pulmonary parenchyma, suppuration of the cystic cavity, and concomitant aspiration with stiffness of the lobe and no salvageable lobar parenchyma (Arroud et al., 2009; Harlaftis et al., 2009; Usluer et al., 2010). After insertion of two chest tubes 30 or 32 French sizes in the pleural space, one in the posterolateral and the other in the upper pleural space for draining blood and air, the chest was closed using classic approach. All patients received prophylactic antibiotic therapy with cefazolin (30 mg/kg/day) preoperatively. The chest tubes were removed when no air leak was evident. Decisions for re-operation and second thoracotomy were made when evidences of empyema with

massive air leak were present in the chest tubes. These bronchopleural fistulae cases were mostly seen in patients underwent pulmonary parenchyma saving or capitonnage technique. All patients received albendazole (10-20 mg/kg/day or 800 mg daily) after surgery (Sokouti and Nazemieh, 2008; Sokouti and Montazeri, 2008).

Table 1. Demographic features of the patients in non-giant and giant groups (n=612), n (%)

	Non-giant group (n=553)	Giant group (n=59)	P value
Age			
<12 years	62 (11.2)	8 (13.5)	0.59
>12 years	491 (88.8)	51 (86.5)	0.59
20-40 years	125 (22.6)	32 (54.2)	<0.001
Male:female	331:222	35:24	0.93

The impact of surgical results was assessed by total length of hospitalization, duration of air leak from the chest tubes, occurrence of postoperative pulmonary complications including pneumothorax, prolonged air leakage, pneumonia, atelectasis, bronchopleural fistula, empyema, mortality and morbidity. Diagnoses of pneumothorax and atelectasis were made based on the clinical signs, fever and decreased pulmonary sounds in auscultation which were later confirmed by chest imaging. All patients were followed up in the surgical outpatient clinic and relevant information was recorded in their hospital or outpatient clinic files for at least two years.

Data were presented as mean \pm standard deviation (SD), or percentage. Statistical analysis was performed with SPSS for windows version 13.0 using Chi-square test, Fisher's exact test and independent-samples t-test wherever appropriate. A $P < 0.05$ was considered statistically significant.

3. Results

A total of 612 patients, 366 males and 246 females, were recruited in this study. There were no differences in gender and age between the groups (Table 1, $P > 0.05$). However, giant hydatid cysts were more prevalent among patients aged 20-40 years (Table 1, $P < 0.001$). The most common symptoms in the giant group were cough (100%), dyspnea (71.2%), chest pain (64.4%), and wheezing (30.5%). Figures 2 and 3 show chest X-ray and CT scan of giant pulmonary hydatid cysts. These symptoms along with the systemic symptoms (fatigue, weight loss, anemia, and febrile episode) were more observed in the giant group (Table 2, $P < 0.001$). Moreover, ruptured hydatid cysts were more reported in the giant group than the non-giant group (40.6% vs. 9%, $P < 0.001$). In contrast, those in the non-giant

group were more asymptomatic than the giant group (Table 2, $P = 0.01$).

The types of surgeries performed in the treatment of pulmonary hydatid cysts are shown in Table 3. The lung preservation procedures (capitonnage, uncapitonnage or segmentectomy) as well as the cyst delivery were more performed in the non-giant group ($P < 0.001$, Table 3). The latter was due to early rupture of the cysts in the giant group throughout the surgery. On the other hand, lobectomy, needle aspiration and bronchial opening closure procedures were more applied to the giant group ($P < 0.05$, Table 3).

Table 2. Patients' symptoms at presentation (n=612), n (%)

	Non-giant group (n=553)	Giant group (n=59)	P value
Cough	150 (27.1)	59 (100)	<0.001
Dyspnea	29 (5.2)	42 (71.2)	<0.001
Chest pain	70 (12.7)	38 (64.4)	<0.001
Wheezing	32 (5.8)	18 (30.5)	<0.001
Mild hemoptysis	104 (18.8)	16 (27)	0.12
Massive hemoptysis	0 (0)	1 (1.7)	NA
Respiratory failure	2 (0.4)	1 (1.7)	NA
Chest wall deformity	0 (0)	3 (5)	NA
Ruptured hydatid cysts	50 (9)	24 (40.6)	<0.001
Systemic symptoms			
Fatigue	10 (1.8)	25 (42.4)	<0.001
Weight loss	7 (1.3)	13 (22)	<0.001
Anemia	18 (3.3)	8 (13.5)	<0.001
Febrile episode	36 (6.5)	10 (17)	0.004
Asymptomatic	52 (9.4)	0 (0)	0.01

Table 3. Types of surgeries in non-giant and giant groups, n (%)

	Non-giant group (n=553)	Giant group (n=59)	P value
Cyst delivery	296 (53.5)	2 (3.4)	<0.001
Needle aspiration	207 (37.4)	33 (55.9)	0.006
Lung preservation	546 (98.7)	13 (22)	<0.001
Lobectomy	7 (1.3)	39 (66.1)	<0.001
Bronchial opening closure	0 (0)	7 (12)	<0.001
Emergency operation	0 (0)	1 (1.7)	NA

The mean length of hospitalization was 28.21 ± 6.53 days in the non-giant group versus 18.41 ± 4.31 days in the giant group ($P = 0.02$). The postoperative pulmonary complications including air leakage (prolonged or minor), pneumothorax, atelectasis, and pneumonia were more observed in the non-giant group ($P < 0.001$, Table 4). Nonetheless, there were no differences in empyema and anaphylaxis between the two groups ($P > 0.05$, Table 4).



Figure 2. Chest X-ray showing a giant pulmonary hydatid cyst filling the left hemithorax shifting the mediastinum and heart to the right



Figure 3. CT scan of the chest showing a huge pulmonary hydatid cyst extending from apex of the left lung to the diaphragm filling 80% of the left hemithorax shifting the heart to the right

Table 4. Postoperative complications in non-giant and giant groups, n (%)

	Non-giant group (n=553)	Giant group (n=59)	P value
Air leak			
Prolonged (8-91 days)	210 (38)	4 (5.4)	<0.001
Minor (1-7 days)	100 (18)	0 (0)	<0.001
Pneumothorax	147 (26.6)	4 (6.8)	<0.001
Atelectasis	210 (38)	8 (13.5)	<0.001
Pneumonia	159 (28.7)	1 (1.7)	<0.001
Empyema	37 (6.7)	2 (3.4)	0.32
Anaphylaxis	4 (0.7)	1 (1.7)	NA
Recurrence	12 (2.1)	3 (5)	0.16
Mortality	0 (0)	1 (1.6)	NA

4. Discussion

The present study revealed that giant hydatid cysts were more prevalent in adolescence being associated with more symptoms and less postoperative complications. The latter could be attributed to aggressive surgical approaches such as

lobectomy of the lung rather than the lung parenchyma preserving procedures. Giant hydatid cysts are more common in adolescence (Lamy et al., 1993; Montazeri et al., 2007; Harlaftis et al., 2009). However, Halezeroglu et al. (1997) and Usluer et al. (2010) reported that patients with pulmonary giant hydatid cyst were younger than those with usual-sized cysts. In the present study, giant hydatid cysts were significantly more prevalent among patients aged 20-40 years. Furthermore, giant cysts have usually been reported to be symptomatic in the literature, as in our series (Arroud et al., 2009; Usluer et al., 2010). In contrast, a recent study on adult population revealed no difference in the clinical presentation between the giant and non-giant groups (Kocer et al., 2009). Due to excessive fluid and volume, giant hydatid cysts can produce higher surrounding tissue pressure and cause more symptoms such as cough with or without purulent sputum, severe dyspnea, chest pain, hemoptysis, nausea, vomiting and even chest wall deformities. Hemoptysis is usually minimal and rarely life threatening as seen in one case of our patients (Topçu et al., 2000; Karaoglanoglu et al., 2001).

In the present study, the lung preservation procedures and the cyst delivery were more performed in the non-giant group, while lobectomy, needle aspiration and bronchial opening closure procedures were more applied to the giant group. In addition, we attempted to perform parenchyma-saving procedures in a few patients with giant lung cysts who had 80% to 90% destruction of the lung. However, at the end of the surgery, the residual lobe of the lung parenchyma collapsed and became non-functional, therefore completed lobectomy was inevitable. In some other patients in which lung preserving procedures had been used, due to collapsing and pneumonia or prolonged air leak and repetitive pneumothorax, second thoracotomy was required and the remaining parenchyma was also required to be resected. In contrast to our findings, a number of previous studies applied the parenchyma-saving operation to patients with giant pulmonary hydatid cysts (Halezeroglu et al., 1997; Karaoglanoglu et al., 2001; Ekim et al., 2009; Hasdiraz et al., 2006; Usluer et al., 2010). In addition, some case reports exist in the literature in which very large hydatid cysts were safely treated by parenchyma-preserving surgery, rather than performing lobectomy (Ghallab and Alsabahi, 2008; Sinmaz and Celiksöz, 2009). In contrast, Kocer and colleagues (2009) reported no difference in surgical procedures between the giant and non-giant groups. Those studies in which parenchyma-saving operations were preferred in the giant hydatid cysts were usually followed by higher rates of

postoperative complications (Halezeroglu et al., 1997; Karaoglanoglu et al., 2001). However, as most of these complications can be treated conservatively, we have recently recommended parenchyma-saving operations in such cases (Sokouti et al., 2011). In the present study, the postoperative pulmonary complications and prolonged length of hospitalization were more observed in the non-giant group, in which almost all patients underwent parenchyma-sparing procedures. As a result, the authors believe that attempting to preserve little lung parenchyma could be followed by more complications such as atelectasis, infection, prolonged air leak and pneumothorax, as observed in the present study. Multi-organ hydatid cysts are possible risk factors for complications, but in this study due to having no symptoms in other organs, surgery of pulmonary hydatid cysts were performed at first and after recovery they referred to general and neurosurgery wards (Kayhan and Akgüneş, 2011).

Misdiagnosis of pulmonary hydatid cysts in chest x-ray and chest CT scan was occurred in a few patients such as lung carcinoma, and diagnostic dilemma had solved in the operating room. Recently some new serologic diagnostic tests such as Western Blot tests, 8-12 KDa, 24 KDa and 124 KDa presented in which specific for diagnosing Echinococcus with a few false-positivity (Akisu et al., 2005). However, we did not use these new diagnostic tools due to unavailability. Some complicated forms of giant pulmonary hydatid cysts such as pleural effusion, pneumothorax and empyema were diagnosed by thoracoscopy preoperatively (Gursoy et al., 2009). The incidence of recurrences in the giant cyst group was slightly higher than the literature. This might be due to using needle aspiration in more than half of the patients and high incidence of ruptured hydatid cyst on admissions of giant group.

In conclusion, the patients undergoing the surgery of giant pulmonary hydatid cysts, using lobectomy in comparison with the lung preserving procedures experience lesser postoperative pulmonary complications and total length of hospitalization.

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11/19/2012