

## Evaluating the Effect of Pulmonary Hydatid Cyst on Lung Function Tests in Pediatric Pulmonary Hydatidosis

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### Abstract

**Background:** The effect of treatment on lung function in children with pulmonary hydatid cyst is not determined yet. Regarding the high prevalence of pulmonary involvement in pediatric patients with hydatid cyst and its destructive effects on the lungs, we aimed to evaluate the lung function tests before and after treatment in children with pulmonary hydatid cyst.

**Methods:** 30 pediatric patients with pulmonary hydatid cyst were included in this study. Data was gathered using a checklist which consisted of demographic data and patient characteristics, radiologic findings and diagnostic tests. For all 30 patients, spirometry was performed before and after the treatment.

**Results:** The mean age of patients was  $8.5 \pm 2.2$  years. Most of the patients were male (76%) and living in rural areas (80%). Lower zone of the right lung was the most common site of involvement. Simultaneous involvement of the lung and liver was observed in 13.3% of the patients. Pulmonary function tests were evaluated before and after surgical treatment of the hydatid cyst. The Forced Expiratory Volume 1 (FEV1) and Forced Vital Capacity (FVC) were not significantly different before and after the treatment ( $P > 0.05$ ), but FEV1 to FVC ratio was significantly increased after treatment ( $P < 0.001$ ).

**Conclusion:** The results of this study revealed positive effects of the treatment on the pulmonary function tests in children with pulmonary hydatid cysts. However, further studies are needed in this area.

**Key Words:** Hydatid cyst, Pulmonary function test, Spirometry.

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## 1- INTRODUCTION

Hydatid disease is a zoonotic infection caused by *Echinococcus granulosus* tapeworm (1). This infection occurs worldwide but is endemic in some regions of the world. Iran is an endemic area for hydatid disease. The prevalence of hydatid disease in Iran is reported to be 0.61-2 per 100000 of the population (2).

Hydatid cysts can occur in any of the organs like liver, lung, kidney, brain, heart and bone (3). In children, the most frequent site of involvement are lungs (4). Because of the elasticity of the lung parenchyma, lung hydatid cysts can enlarge faster and reach large sizes (5). Most affected children are diagnosed due to respiratory symptoms like cough, dyspnea, chest pain and hemoptysis or are discovered incidentally(6). Large pulmonary cysts can cause bronchial compression. They may rupture, become infected or cause pneumothorax (6).

Chest X ray, chest sonography, chest CT scan along with serologic tests are diagnostic modalities used for the diagnosis of pulmonary hydatid cyst (7).

Surgery is the treatment of choice in pulmonary hydatid cyst. In children, it is most important to use the most conservative approach to save the lung parenchyma as much as possible (8-10). The prognosis after surgery is usually excellent and the mortality rate is not significant.

Pulmonary function testing is performed in children with respiratory conditions to evaluate for airway obstruction, restrictive conditions, diffusion defects, and respiratory muscle functioning (11). Spirometry provides both flow and volume measurements, is easy and relatively inexpensive to perform, and when it is done correctly it can be quite reliable (12). Important parameters that are evaluated by spirometry are forced expiratory volume in one second (FEV1); flow between 25 and

75 percent of the vital capacity (FEF25-75%), which is sometimes also called the Maximal Mid Expiratory Flow Rate (MMEFR); Peak Expiratory Flow Rate (PEFR) and Forced Vital Capacity (FVC)(13).

Lung function tests are not routinely evaluated in children with pulmonary hydatid cysts and effects of these cysts on pulmonary function tests is not well known. So, we conducted the present study to evaluate the effects of the presence of a cystic mass in lung parenchyma on pulmonary functions to see whether it can cause flow or volume disturbances and also to investigate the effects of the treatment on these parameters.

## 2- MATERIALS AND METHODS

This was a prospective cross sectional study. 30 children between 6 to 16 years with a diagnosis of pulmonary hydatid cyst who were admitted to Dr Sheikh children's hospital between 2020 and 2023 were included in the study. This hospital is affiliated with Mashhad University of Medical Sciences and is a pediatric referral surgery and pulmonology center in North East of Iran.

All 30 patients underwent surgery for the treatment of the pulmonary hydatid cyst. Spirometry was performed before the surgical intervention and again at a six month interval post-surgery. The diagnosis of pulmonary hydatid cyst was made through imaging findings and serology tests.

Exclusion criteria were comorbid pulmonary or cardiac conditions that can affect spirometer parameters; and unwillingness to participate on the part of the patient or his/her guardians.

A checklist was used for gathering the patient's information. Spirometry was performed by two fixed trained nurses.

The study was approved by the medical ethics committee of Mashhad University

of medical sciences prior to performance and all patient guardians signed informed consent.

### 2-1. Data Analysis

All statistical analyses were performed using the SPSS 20 statistical package. Mean and standard deviation were used for reporting the normally distributed data and categorical data were expressed as percentage and numbers. Two-tailed Student's t-test was used for group comparisons. P-value<0.05 was considered as significant.

### 3- RESULTS

30 children between 6- 16 years of age with the diagnosis of pulmonary hydatid cyst were included in the study. Mean age of the patients was 8.5±2.2 years. 76% were male and 24% were female. 80% were residents of rural areas.

Combination of serology test and ultrasonography or CT scan of the lung was used as the diagnostic modality.

All patients were symptomatic at the time of diagnosis and the most prevalent symptoms were cough (76.7%) and dyspnea (43.3%). Other reported

symptoms were chest pain, hemoptysis, weight loss and abdominal pain.

Lower lobe of the right lung was the most frequent site of involvement. 4 (13.3%) patients had simultaneous involvement of the lung and liver and 5 patients had bilateral lung involvement.

All 30 patients underwent surgical resection of the cyst and received Albendazole for 1 to 3 months after surgery. 21 patients underwent complete resection of the cyst. 4 had a perforated cyst and the perforated cyst was resected. Lobectomy was performed in 5 patients.

Spirometry parameters were evaluated before surgical intervention and 6 months post-surgery. FEV1, FVC and FEV1 to FVC ratios were investigated (Table 1).

As shown in table 1, before and after the treatment, FEV 1 was in the normal range. However, both pre- and post-treatment FVCs were below 80%, though statistical analysis didn't show any significant difference between these two parameters pre- and post-surgery. FEV1/FVC ratio was in the normal range both before and after surgical treatment; but after the treatment, a significant increase was observed in the results.

**Table-1:** Spirometry parameters before and after the surgical resection of the pulmonary hydatid cyst

Variable	Before treatment mean±SD	After treatment mean±SD	P-Value
FEV1	81.42±11.31	82.83±11.93	0.636
FVC	74.23±11.34	76.63±11.93	0.405
FEV1/FVC	90.61±7.71	104.04±11.41	<0.001

### 4- DISCUSSION

Lungs are the most frequent site of involvement in pediatric hydatid disease. Effect of the presence of this cystic mass, which is usually of a significant size, on lung function has not yet been well evaluated.

This study aimed at evaluating the lung function tests in pediatric pulmonary hydatid cyst and also investigating the effect of surgical intervention on pulmonary function parameters. Results of the present study showed that lung function tests were not significantly

disrupted in children with pulmonary hydatid cyst and surgical intervention on the lungs did not result in impairment of pulmonary function and all patients had normal pulmonary functions, 6 months after surgery.

In a case report, Dyer et al. performed spirometry before surgery of the hydatid cyst and again on the 20<sup>th</sup> day after surgery; they showed that both FEV1 and FVC improved post-surgery (14).

Most studies on lung function tests after surgical lung procedures are for pathologies other than hydatid cyst. In a study by Tocchioni et al., following lobectomy for congenital lung malformations, normal long-term pulmonary function was retained in their study population (15).

In a study by Schaballie et al., the majority of the study population had normal FEV1 and FVC post lobectomy (16).

Panda et al. reported that the incidence of pulmonary function abnormalities in children following thoracotomy was high but they were of mild grades (17). Three of their patients had thoracotomy for the treatment of pulmonary hydatid cyst.

#### 4.1- Limitations of the study

The results of this study might be compromised by its relatively small sample size. Studies with larger populations might yield more reliable results. Results of the spirometry parameters were better to be interpreted according to the size and anatomic location of the cysts. And about the post-surgical parameters, the method of surgery was better to be considered.

#### 5- CONCLUSION

The present study showed that pulmonary function tests were not significantly impaired in children with pulmonary hydatid cyst and the patients

retained normal pulmonary functions, 6 months after surgery.

#### 6- ETHICAL CONSIDERATIONS

All patients' guardians signed informed consent. The study was approved by the medical ethics committee of Mashhad University of medical sciences prior to performance (IR.MUMS.fm.REC.1396.384).

#### 7- CONFLICT OF INTEREST

None.

#### 8- ACKNOWLEDGEMENTS

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