Is Anatomic Lung Resection Necessary in Surgical Treatment of Giant Lung Hydatid Cysts in Childhood?

Omer Onal, MD and Omer Faruk Demir, MD

Purpose: The aim of this study is to evaluate the results of parenchymal saving methods for giant lung hydatid cysts and to discuss the necessity of anatomic lung resection in childhood.

Methods: The patients under the age of 16 years who were operated between January 2000 and January 2017 due to pulmonary hydatid cyst were evaluated retrospectively (n = 200). In all, 32 patients who had giant hydatid cyst were included in this study. Parenchymal saving methods (cystotomy–capitonnage) were preferred and decortication was also performed for pleural thickening if needed. No lung resections were applied.

Results: Male patients were 53.1%. The mean age was 11.3 ± 3.2 years. The total number of giant cysts was 32. The average size of the cysts was 11 cm. Thirty seven point five percent of the cysts were perforated. Postoperative complication rate was 31.3%. No recurrence and mortality were seen during follow-up period.

Conclusion: Considering the high recovery capacity of lung tissue, a chance should be given to recover the existing infection, atelectasis, and parenchymal damage. Especially in areas where hydatid disease is endemic, children may be infected with the parasite again. For these reasons, we do not recommend resection with any indications.

Keywords: childhood, hydatid cyst, giant, resection, surgery

Introduction

Hydatid cyst is a parasitic infection that grows faster in lung than in liver due to the elastic structure of lung. These cysts can be invasive to most part of the lobe by reaching giant dimensions. Hydatid cysts with a diameter of 10 cm or high are defined as giant hydatid cysts. Giant hydatid cysts are more common in childhood than adults. Surgery is the main treatment of hydatid cysts. The goal of the surgical treatment is to provide the eradication of the parasite, to prevent intraoperative spread and to remove the cavity. Nevertheless, high lobectomy rates (6.3%–54.5%) were reported for giant lung hydatid cysts in the literature. The aim of this study is to evaluate the results of parenchymal saving methods for giant lung hydatid cysts and to discuss the necessity of anatomic lung resection in childhood.

Materials and Methods

The patients under the age of 16 years who were operated between January 2000 and January 2017 due to pulmonary hydatid cyst were evaluated retrospectively (n = 200). In all, 32 patients who had giant hydatid cyst were included in this study. Characteristics of the patients and the cysts were obtained from chest computed tomography reports, surgical notes, and pathologic results. Muscle-sparing thoracotomy was applied to all the patients.
Parenchymal saving methods (cystotomy–capitonnage) were preferred and decortication was also performed for pleural thickening if needed. No lung resections were required. Statistical Package for Social Sciences version 15.0 (SPSS Inc., Chicago, IL, USA) was used in statistical analysis. All patients’ parents received full information on the protocol and signed an informed consent form. The Ethics Committee of the University Medical Faculty approved this retrospective study (No: 2016/366).

### Results

53.1% (n = 17) of the patients were males and 46.9% (n = 15) were females. The mean age was 11.3 ± 3.2 years. The symptoms were cough, 68.7% (n = 22); sputum, 56% (n = 18); chest pain, 43.7% (n = 14); dyspnea, 37.5% (n = 12); fever, 18.8% (n = 6); hemoptysis, 9.4% (n = 3); and abdominal pain, 6.3% (n = 2). The total number of giant cysts was 32. The average size of the cysts was 11 cm (minimum: 10 cm and maximum: 15 cm). The localizations of the cysts were 34.4% (n = 11) in the right lower lobe, 28.1% (n = 9) in the left lower lobe, 15.6% (n = 5) in the right upper lobe, 12.5% (n = 4) in the left upper lobe, and 9.4% (n = 3) in the right middle lobe. Sixty two point five percent (n = 20) of the cysts were intact and 37.5% (n = 12) of the cysts were perforated. Twenty five percent (n = 8) of the cysts had perforation to bronchial system and 12.5% (n = 4) of the cysts had perforation to pleura. Eighty seven point five percent (n = 28) of the patients had unilateral hydatid cyst. Twelve point five percent (n = 4) of the patients had bilateral hydatid cyst. In bilateral hydatid cysts, only the cysts in one side were giant cysts. So we did not include the non-giant hydatid cysts in statistical analysis. Also three (9.4%) of the patients had hydatid cysts in liver. Atelectasis was the most common postoperative complication (Table 1). Bronchopleural fistulas were occurred in two patients. No additional surgical interventions were required in these patients. The median value of duration of chest tube was 5 days (minimum: 4 and maximum: 17). The median value of hospitalization was 7 days (minimum: 5 and maximum: 20). The mean follow-up period was 59.4 ± 41.0 months. No recurrence and mortality were seen during this period.

### Discussion

Parenchymal saving surgery (cystotomy–capitonnage) is the most appropriate and preferred treatment modality in lung hydatid cysts. Especially in endemic areas, patients are always at risk of encountering and becoming infected again with parasites. For this reason, methods such as lobectomy and pneumonectomy which result in loss of parenchyma should be avoided in endemic areas. Nevertheless, excessively high lung resection rates were reported in the literature for lobectomy as 0%–52.1% and for pneumonectomy as 0–11.4% in the surgical treatment of lung hydatid cysts. Some authors pointed out the indications for lung resection as the invasion of more than 50% of the lobe by cyst or presence of multiple cysts in the same lobe. This indicates increase the resection rates very severely. In pediatric patients, the sizes of lung lobes are smaller than adults. If a child has a giant hydatid cyst that means a cyst 10 cm in diameter, it will invade more than 50% of any lobe. In our study, 32 pediatric patients with giant lung hydatid cysts were evaluated. No lobectomy was required although more than 50% of the lobe was invaded by the cyst. We perform cystotomy and capitonnage technique in hydatid cyst surgery. After closing the bronchial leaks with absorbable sutures, we begin to suture from the deepest part of the cavity with absorbable purse string sutures that remain about 2 cm between each layer (capitonnage). We do not agree with the idea that suggesting lobectomy just according to the rate of invasion of the lobe by the cyst. We also think that preferring resection is a very invasive approach due to presence of multiple cysts in the same lobe. Perforation is the most frequent complication of pulmonary hydatid cysts. In the literature, the perforation rates were stated as 24.7%–61%. Perforation of the cyst can cause hemoptysis, pneumothorax, hydro pneumothorax, empyema, pleural thickening, secondary pleural hydatid disease, and destruction of parenchyma. Therefore, some publications suggest more radical surgical procedures such as decortication, segmentectomy, or lobectomy in these patients. Also perforated hydatid cysts have higher resection rates (0%–7%) than intact cysts (19%–32%). This situation has been explained as a result of serious damage to the lung tissue caused by ruptured cysts. Yekeler et al.

### Table 1 Postoperative complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Frequency (n)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atelectasis</td>
<td>5</td>
<td>15.6</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>2</td>
<td>6.3</td>
</tr>
<tr>
<td>Bronchopleural fistula</td>
<td>2</td>
<td>6.3</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>31.3</td>
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</table>
reported eight pediatric cases that underwent lobectomy due to giant hydatid cyst. In six of them, the cysts were ruptured directly into the bronchial system and the parenchyma was destructed. They suggested that the decision of lobectomy could be made easily by detecting the opening of the lobe bronchus to the cyst cavity with preoperative flexible bronchoscopy. Cangir et al. \(^{16}\) reported bronchial and pleural perforation rates as 21.1% and 3.6%, respectively. In our study, 37.5% (n = 12) of 32 giant cysts were perforated. 25% (n = 8) of the cysts had perforation to bronchial system and 12.5% (n = 4) of the cysts had perforation to pleura. Although pleural thickening and parenchymal damage were existed in these patients, no lung resection was required.

Bronchopleural fistulas were occurred in two patients. In recent years, endobronchial methods have been proposed for the treatment of bronchopleural fistulas.\(^{23,24}\) In our series, no additional surgical interventions were required for these patients.

Hemoptysis is a rare symptom of pulmonary hydatid disease. It may be caused by pneumonia or abscess that develops on the basis of the underlying atelectasis and destruction of the bronchus, vascular structures, or parenchyma by the cyst. If the cyst is localized in the vicinity of the large vascular structures, it may cause massive hemoptysis and death via erosion of the vessel wall.\(^{25}\) Hemoptysis rates were reported between 1.8% and 8% in different publications.\(^{3,14,25}\) Yekeler et al.\(^{14}\) reported 17 patients with hemoptysis and 13 of them had perforated hydatid cysts. They stated two patients underwent lobectomy due to massive hemoptysis and the other two patients underwent lobectomy due to ongoing hemoptysis during cystotomy and capitonnage. In our study, hemoptysis rate was 9.4% (n = 3). Thorax computed tomography of one of these patients showed that there was a perforated hydatid cyst into pleura in the right lower lobe (Fig. 1). The patient underwent cystectomy and capitonnage with muscle-sparing thoracotomy (Fig. 2). During the operation, sudden hemoptysis, weak airflow, and low saturation developed in the patient. Immediate intraoperative rigid bronchoscopy was performed to clear the secretion and blood in the bronchial
system. Bleeding was detected in the right lower lobe bronchus and it was stopped after irrigation with cold saline. The operation was completed without requiring lobectomy. The patient was discharged on the postoperative 6th day.

In another study, Topcu et al.\textsuperscript{15} reported that the method they preferred was cystotomy and capitonnage even in the presence of bronchiectasis. They indicated that especially in children and young adults, lung resection should not be routinely performed regardless of the cyst’s size even in complicated cysts. Some authors including us support this opinion because of the high healing capacity of the lung in children.\textsuperscript{12,15,19}

In the literature, postoperative complication rates in patients who underwent lung resection for hydatid cysts were reported as wound site infection 19.4%, pneumonia 11.1%, atelectasis 8.3%, empyema 8.3%, prolonged air leakage 5.5%, drainage requiring revision 5.5%, and aseptic space 5.5%.\textsuperscript{14} In our study, the most common postoperative complication was atelectasis. Our complication rates are not very high when compared with the postoperative complications of lung resections. Although we had an overall complication rate of 31.3%, all patients recovered without resection. This shows us that the recovery potential of the lung in the pediatric age group is very high.

Sokouti et al.\textsuperscript{26} suggested performing lung resections in the treatment of giant lung hydatid cysts due to lesser length of hospitalization of lobectomy when compared with parenchyma saving methods 18.41 ± 4.31 and 28.21 ± 6.53 days, respectively. In our study, the mean duration of hospitalization was 11.4 ± 5.7 days. When we compared both studies in terms of hospitalization time, parenchymal-sparing surgery does not increase the length of hospital stay. We analyzed the literature and summarized the rates of lung resections performed in the treatment of giant lung hydatid cysts in Table 2. In our study, the length of hospital stay, lung resection, morbidity, and recurrence rates were also lesser than the rates declared in the literature for lung resections.

### Conclusion

After a parenchymal saving surgery, the treatment of complications that may develop is possible and can be reversible. However, the reduced pulmonary capacity of a child who had lobectomy will not be reversible. Considering the high recovery capacity of lung tissue, a chance should be given to recover the existing infection, atelectasis, and parenchymal damage. Especially in areas where hydatid disease is endemic, children may be infected with the parasite again. For these reasons, we do not recommend resection with any indications. Consequently, anatomic lung resection is not necessary in the treatment of giant lung hydatid cysts in childhood.

### Disclosure Statement

The authors have no fundings no financial relationships, and no conflicts of interests.

### References


