Hydatid disease, that is caused by *Echinococcus granulosus* and *Echinococcus multilocularis*, is also known as echinococcosis or hydatidosis (1). The disease is endemic in a number of sheep- and cattle-raising countries, including Middle East and Mediterranean countries, New Zealand, Australia and India (1,2). Humans take part as accidental intermediate hosts and harbor cysts, which are most commonly found in the liver and lung but can be discovered in any organ (3). Pulmonary hydatid cysts rarely heal by spontaneous discharge into the bronchus. However, rupture into bronchial system, anaphylactic reaction, suffocation caused by cystic fluid are serious and possibly fatal complications (2,3). Surgical methods for treatment of pulmonary cysts include enucleation of intact cysts, and cystotomy, with or without capitonnage, for complicated or intact cysts (4). Capitonnage may shorten hospitalization time 1 day; however, the real benefit of this method remains unsolved (4). The standard management of pulmonary hydatid disease is surgical removal of cysts with or without capitonnage via thoracotomy or sternotomy in patients with bilateral disease (5,6). Preoperative evaluation of a patient with hydatid cyst of the lung should start with identifying the number and localization of the cysts. Surgical treatment for pulmonary hydatid cyst disease should include evacuation of the intact or ruptured cyst, removal of the germinative membrane, and capitonnage of the residual space (i.e., pericystic cavity) whereas preserving as much lung parenchyma as possible. The hydatid cyst disease of the lung surgery is associated with low complication and very low mortality rates (4-6).

It is fair to speculate that the greatest advance in thoracic surgery of the last 30 years has been the advent of video-assisted thoracoscopic surgery (VATS) (7). VATS has been shown to significantly reduce pain, quicken recovery, decrease complications, and improve post-operative quality of life of patients when compared to open thoracotomy (8,9). For this reason, VATS has now become a new standard of thoracic surgery. When VATS was first introduced 25 years
ago, the approach typically used three ports without rib-spreading (8). There could also be an additional ‘utility’ port to extract the resected specimen. During the recent 10 years, great effort has been paid to reduce the port numbers to 3 and 2 in order to further reduce the postoperative pain and increase the quality of life (10). Performing the procedures using only one incision (uniportal VATS) was first introduced by Rocco (11). Uniportal VATS has been become eventually the major breakthrough in thoracic surgery and it was proven that most thoracic procedures can safely and perfectly be performed via uniportal VATS (12).

The minimally invasive treatment of pulmonary hydatid disease was first introduced in 1994 by Becmeur and colleagues (13). The feasibility of the procedure has been proven by others (14-23). Alpay et al. demonstrated that, VATS treatment of pulmonary hydatid disease was superior to thoracotomy causing lower pain, shorter operation time, lower chest tube drainage volume and shorter chest tube duration (19). Ma and colleagues (21) also reported that, VATS treatment of pulmonary hydatid disease in children was associated with less intraoperative blood loss, shorter chest tube duration, reduced postoperative pain and lower hospitalization cost. Ocakcioglu and Sayir (22) confirmed that, VATS is better in terms of postoperative patient-related parameters. VATS treatment follows the same principles as the thoracotomy: aspiration of the cystic fluid, instillation of scolicidal agents (diluted povidone-iodine), removal of the germinative membrane, closure of the bronchial openings, and capitonnage of the cavity. Total enucleation of unruptured cyst can be performed in open surgery, whereas, it is not safely doable during videothoracoscopic approach since small (i.e., 3-5 cm) utility incision would prevent safe extraction. It is questionable if capitonnage is necessary for pulmonary hydatid surgery. However, we previously showed that, it provides no statistically significant advantage (4), although the difference was approximately 1 day. Table 1 summarizes the studies published regarding VATS treatment of pulmonary hydatid disease.

A number of contraindications for minimally invasive treatment of pulmonary hydatid cyst were reported including giant hydatid cyst, multiple cysts and fissure or hilar location of cysts (19). However, they should not be necessarily the contraindications since multiple cysts can be dealt separately, giant cysts can be removed after aspiration of cystic fluid. Treatment of hydatid cysts at hilar location can be challenging. However, careful exploration of cyst or segmentectomy in select cases can be performed safely. Only non-feasible procedure for VATS approach in the management of pulmonary hydatid disease is enucleation of intact hydatid cyst and removal of the cyst with germinative membrane (i.e., Ugon method) since, complete extraction of unruptured cyst is physically not possible due to narrow and smaller utility incision and delicate nature of the unruptured cyst. However, there has been no publication indicating the necessity of this method as surgical management. Careful aspiration with installation of scolicidal agent around the area has been proven to be equally effective (1-4).

**Uniportal approach to hydatid disease**

Ocakcioglu and colleagues reported that, uniportal VATS can be used for the treatment of pulmonary hydatid disease safely (22). They reported 18 patients who had undergone this approach. We performed uniportal treatment of intact and ruptured pulmonary hydatid disease. The incision was a 3 cm long incision placed at 5th intercostal space. We used 30-degree telescope. After the lung was deflated by the usage of double-lumen intubation, the povidone-iodine soaked gauzes were placed around the cystic lesion to prevent any possible intrathoracic contamination. The cystic fluid was aspirated if the cyst was intact. using an inserted needle connected to a closed-circuit suction device (Figures 1,2). The cystic fluid was aspirated almost completely. If the cyst was ruptured seen on chest computerized tomography (CT), no aspiration was performed. The exocyst was cut using

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**Table 1** Publications reporting video-assisted thoracoscopic treatment of pulmonary hydatid disease

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becmeur et al.</td>
<td>1994</td>
<td>10</td>
</tr>
<tr>
<td>Paterson et al.</td>
<td>1996</td>
<td>1</td>
</tr>
<tr>
<td>Mallick et al.</td>
<td>2005</td>
<td>1</td>
</tr>
<tr>
<td>Pareikar et al.</td>
<td>2009</td>
<td>5</td>
</tr>
<tr>
<td>Findikcioglu et al.</td>
<td>2012</td>
<td>12</td>
</tr>
<tr>
<td>Alpay et al.*</td>
<td>2015</td>
<td>77</td>
</tr>
<tr>
<td>Ma et al.</td>
<td>2016</td>
<td>44</td>
</tr>
<tr>
<td>Eroglu et al.</td>
<td>2016</td>
<td>23</td>
</tr>
<tr>
<td>Bakhytzhan et al.*</td>
<td>2018</td>
<td>30</td>
</tr>
<tr>
<td>Ocakcioglu et al.*</td>
<td>2018</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>–</td>
<td>221</td>
</tr>
</tbody>
</table>

* Comparative study including open surgery.
endoscopic scissors while a suction cannula was placed around and inside the cystic cavity to remove any possible spillage. The germinative membrane was removed through the incision (Figure 3). After cutting the edges of pericystic cavity, the bronchiolar openings were identified by the instillation of saline solution into the cavity while inflating the lung. The residual cavity was carefully cleaned. The bronchiolar openings were closed using 3-0 polyglactin sutures (Vicryl, Ethicon, USA). After bronchial openings were closed, the cavity was obliterated by imbricating sutures from within using 3-0 polyglactin sutures (capitonnage). With application of positive intrapulmonary pressure, any possible air leak was visualized and sealed.

After the operations, the patients were cared in service ward without a need for intensive care unit. In our practice, we performed unilateral uniportal approach for the cysts as well as consecutive operations for bilateral diseases. It was also possible to perform simultaneous bilateral subxiphoid uniportal treatment for a patient with bilateral pulmonary hydatid disease with a hepatic hydatid disease (Figure 4).

Regarding the recurrence after videothoracoscopic approach, only two recurrences were reported out of 221 patients reported so far in the literature. Alpay and associates (19) reported no recurrence in any of groups.

Figure 1 A 32-year-old female with bilateral pulmonary hydatid disease.

Figure 2 Aspiration of cystic content of a patient with bilateral pulmonary hydatid disease (25).
Available online: http://www.asvide.com/article/view/29875

Figure 3 Removal of germinative membrane of the patient with right pulmonary hydatid disease (26).
Available online: http://www.asvide.com/article/view/29877

Figure 4 Operative view of the subxiphoid single uniportal approach in a patient with bilateral pulmonary hydatid disease and hepatic cyst. Hepatic cyst was treated via a median laparotomy.
In conclusion, minimally invasive removal of hydatid cysts is feasible and safe operation that is associated with better operative and postoperative results and less pain. Various sizes of peripheral and central hydatid cysts can be removed safely.

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None.

Footnote
Conflicts of Interest: The author has no conflicts of interest to declare.

References


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