SURGICAL TREATMENT OF HYDATID CYSTS OF THE LUNG: ANALYSIS OF 405 PATIENTS

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OBJECTIVE: The choice of operation, postoperative success and complications of surgery in patients with pulmonary hydatid cysts.

DESIGN: A series of patients seen over 15 years.

SETTING: A university clinic.

PATIENTS: Four hundred and five patients (209 male, 196 female) ranging in age from 4 to 72 years (mean 29 years). Most (367 patients) had isolated lung cysts; 38 had both liver and lung cysts.

INTERVENTIONS: A variety of procedures to remove cysts, including enucleation and capitonnage, wedge resection, segmentectomy, lobectomy and pneumonectomy. Six patients with bilateral cysts were operated on through a median sternotomy approach. Others underwent posterolateral thoracotomy.

MAIN OUTCOME MEASURES: Value of diagnostic tests, the most efficacious approach for cyst removal and recurrence and death rates.

RESULTS: Chest radiography gave a correct diagnosis in 99% of patients. The Casoni and Weinberg tests were discontinued because of high false-negative rates (up to 35%). Hospital mortality was 1.2% and postoperative complications occurred in 5.2%. The recurrence rate was 1.5%.

CONCLUSIONS: Lung-preserving surgical interventions are the treatment of choice for pulmonary hydatid disease. In patients with bilateral cysts, the median sternotomy approach is preferred, and in the patients with right lung disease and coexisting liver cysts the transdiaphragmatic approach is the one of choice to remove cysts in 1 stage.
Hydatid disease is said to be between 1/50,000 and 1/200,000, it is particularly common in the rural population. In this population, the lung is the second most common site for hydatid cysts after the liver. We report our experience of the surgical management of 405 cases of pulmonary hydatidosis.

**Patients and Methods**

Between 1978 and 1993, 405 patients (209 male, 196 female) with pulmonary hydatid disease were operated on in our department. Patients ranged in age from 4 to 71 years (mean 29 years). Most of them (85%) were from rural areas. Of these 405 patients, 367 (90.6%) had isolated pulmonary cysts and 38 had coexisting liver cysts.

Although chest pain, cough, purulent sputum and fever were common presenting symptoms (Table I), 65 patients (16%) were symptom free. Asymptomatic cysts were diagnosed incidentally on chest radiography done for other purposes. Oval or spherical opacities in the lung fields on chest radiographs were considered to be diagnostic of uncomplicated cysts (Fig. 1). Twenty-five patients with perforated cysts had various radiographic signs including air-fluid levels (Fig. 2), the meniscus sign (Fig. 3) and the water-lily sign (Fig. 4). A preoperative diagnosis of hydatid disease based on chest radiography was correct in 99% of these patients. When hydatid disease was suspected on chest radiography, other tests for differential diagnoses were carried out. They included the erythrocyte sedimentation rate, the Casoni skin test, the Weinberg reaction, the blood eosinophil count and abdominal ultrasound. The Casoni and Weinberg tests and blood eosinophil counts were done for the first 148 patients but were discontinued because of high false-negative rates, reaching up to 35%. Ultrasonography of abdomen was performed routinely to determine whether liver cysts were present.

The cysts were located in the right lung alone in 256 patients (63.2%), in the left lung alone in 135 patients (33.3%), and in both lungs in 14 patients (3.5%). The lower lobes were affected more often than the upper lobes.

Multiple pulmonary cysts were found in 93 patients, bilaterally in 14 of them (Fig. 1). The lung cysts were intact and uncomplicated in 380 patients (93.8%) and were ruptured in 25 patients.

**Surgical Techniques for Cyst Removal**

In all patients a posterolateral thoracotomy or median sternotomy approach was used. Eight of the 14 patients with bilateral disease underwent staged thoracotomies (6 with median sternotomy). Thus, 413 operations were performed for 405 patients (Table II). Removal of the cysts after needle aspiration and capitonnage, the preferred technique in our clinic, was carried out in 292 patients (72.1%). The cysts were usually seen as soft swellings on the surface of the pulmonary parenchyma. The thoracotomy wound and the lung, apart from the area containing the cyst, were covered with towels moistened with hypertonic saline or povidine iodine and the bronchial openings were sutured. The residual cavity was obliterated by purse-string sutures (capitonnage), starting from the deepest level. Nonabsorbable suture material was used.

Other procedures were also used. In 58 patients, the cysts were removed intact by the Ugoni or Barrer method (enucleation and capitonnage). In 28 patients, the Pérez-Fontana procedure (pericystectomy) was performed. Intact cysts were removed with pericystic zone and the residual cavity was obliterated in this technique. Unexpected postoperative expansion of atelectatic tissue necessitated wedge resection of the cysts in 20 patients with atelectatic pericystic lung tissue.

More radical procedures such as segmentectomy, lobectomy and pneumonectomy were performed in 15 pa-
tients because chronic inflammation, and bronchiectatic changes were present in the surrounding lung tissue.

In 38 patients who had hepatic cysts in association with hydatid cysts of the lung, the liver cysts were managed transdiaphragmatically after the lung cysts had been dealt with. After removal of the liver cysts, the space was washed with antibiotics and the incisions were closed by simple sutures without capitonnage and drainage.

The diaphragm was sutured separately.

RESULTS

Operative mortality was 0.24%: 1 patient had acute myocardial infarction during the operation. The overall hospital mortality was 1.2%, with 4 additional deaths within 30 days of operation. Three of these 4 patients died because respiratory insufficiency developed early in the postoperative period.

Two of them were elderly patients and had undergone removal of coexisting liver cysts at the same operation; the third had huge multiple cysts in the right lung. The fourth patient who had right lung empyema and then septic shock died 20 days after operation. All the patients who died had had posterolateral thoracotomy and conservative surgery (cyst removal after needle aspiration and capitonnage).

Twenty-one (5.2%) patients had

FIG. 1. Multiple hydatid cysts in both lungs of a young patient who underwent a 2-stage thoracotomy.

FIG. 2. Air-fluid level in the right lower lobe was the most common radiologic finding of ruptured hydatid cysts in our series.

FIG. 3. The meniscus sign, a crescent-like air line, at the top of a huge cyst in the left lower lobe is also a radiologic sign of ruptured pulmonary hydatid cysts.

FIG. 4. Floating blastoderm after rupture of the cyst in the right lower lobe looks like a water-lily.
postoperative complications. The most common complication in the early postoperative period was wound infection (10 patients); the others were empyema (2 patients) and hemorrhage (2 patients). Empyema occurred in 3 patients (early in 2 and late in 1) who had ruptured and infected cysts at the time of surgery. Although 2 of them had undergone conservative surgery, the third had had right lower lobectomy. These patients had been treated by tube thoracostomy and appropriate antibiotics, but 1 of them died after the onset of septic shock.

Follow-up was incomplete because almost all of the patients were from rural areas and were of low social and economic status. The patients visited the outpatient clinic for follow-up and chest radiography for periods ranging from 16 to 58 months (mean 25 months).

The recurrence rate was 1.5% (6 patients). In this group conservative surgical techniques had been used. Four of the 6 had ruptured cysts at the time of surgery and recurrent cysts were diagnosed on average 21 months after operation. Two recurrences that were diagnosed in the contralateral lung on the 8th and 11th postoperative months were so small that they could not be detected radiologically before surgery. In 8 patients with bilateral disease who underwent staged thoracotomy there was 1 recurrence; there were no recurrences in the other 6 who were operated on through a median sternotomy group.

**Discussion**

Hydatid disease has been known since the time of Hippocrates and its epidemiology and clinical features have been well described. The current treatment of pulmonary hydatid disease is complete excision of the cyst with maximum preservation of the lung tissue.

The surgical procedure for the treatment of hydatid disease may be conservative or radical. In 1884, Thomas suggested a technique that consisted of incising the lung parenchyma and removing the cyst. Enucleation was reported by Ugon and colleagues in 1946 and Barrett in 1947 who described removal of the parasite and obliteration of the remaining cavity with a series of purse-string sutures (capitonnage). Others described simple enucleation of the cyst without capitonnage of the residual cavity. Pérez-Fontana in 1948 described a new method known as pericystectomy (capsule resection). All these techniques are conservative methods, suitable for uncomplicated cysts.

The choice of surgical technique depends on the conditions encountered during surgery. Conservative techniques, especially cyst removal after needle aspiration and capitonnage of the residual cavity, are the methods of choice in our clinic (Table II). Many authors emphasize that during the removal of cysts after needle aspiration it is practically impossible to avoid spilling the contents into the thorax. Protection of the operative field with sponge gauzes moistened with hypertonic saline, gentle manipulation of the cysts and irrigation of the cavity with a scolicidal agent (such as sodium chloride 3%) helps to prevent recurrence. In our series only 4 patients had recurrent cysts, and 3 of them had had ruptured cysts before operation. This low recurrence rate shows the excellence of our technique of cyst removal after the needle aspiration and capitonnage. Enucleation and obliteration of the residual cavity (the Ugon or Barrett method) are generally performed for peripherally located and small or moderate-sized cysts. If the cyst is very tense or very large it is almost impossible to remove it without rupture. On the other hand hemorrhage and air leak during dissection of the pericystic space is the main disadvantage of Pérez-Fontana’s method. Moreover, after resection of the capsule it may be difficult to obliterate the remaining cavity.

Although some authors recommend leaving the cavity open, we prefer to obliterate it because of the risk of hematoma formation and infection. It is clear that leaving a potential cavity might allow abscess formation. Radial procedures should be avoided, and lung parenchyma must be preserved as far as possible during operation. If, however, destructive lung disease such as bronchiectasis or severe

**Table II**

Operative Techniques Used on 405 Patients With Pulmonary Hydatid Cysts

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. (and %) of patients</th>
</tr>
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<tbody>
<tr>
<td>Cystotomy and capitonnage</td>
<td>292 (70.7)</td>
</tr>
<tr>
<td>Enucleation and capitonnage (Ugon or Barrett method)</td>
<td>58 (14.0)</td>
</tr>
<tr>
<td>Pericystectomy (Pérez-Fontana method)</td>
<td>28 (6.8)</td>
</tr>
<tr>
<td>Cystotomy and wedge resection</td>
<td>20 (4.9)</td>
</tr>
<tr>
<td>Segmentectomy</td>
<td>9 (2.2)</td>
</tr>
<tr>
<td>Lobectomy</td>
<td>5 (1.2)</td>
</tr>
<tr>
<td>Pneumonectomy</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Total</td>
<td>413 (100)</td>
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*2-stage thoracotomy was performed in 8 patients who had bilateral disease.*
inflammation is also present, the affected lung is excised. When the lung parenchyma has been destroyed with very large or multiple cysts, lobectomy or pneumonectomy is appropriate.\(^\text{6,15}\) Lung resection for hydatid disease, first reported by Vaccarezza and Tricerri,\(^\text{16}\) was done in 15 patients of our series with complicated cysts. The complications included parenchymatous lung involvement simulating lung abscess, despite long-term antibiotic treatment and lung destruction by infected liver cysts with intrathoracic extension. Resection is also performed when concomitant bronchiectasis with severe hemoptysis or fibrosis of the lung parenchyma is present. Pulmonary resection should be avoided in children if possible because the damaged lung parenchyma has a great capacity for recovery.\(^\text{1,5,11}\) When bilateral cysts are present some surgeons prefer a 2-stage thoracotomy, operating on the side with the larger cyst first, but others perform simultaneous bilateral thoracotomies.\(^\text{1,7,10}\) Recently, indications for median sternotomy have been widely increased.\(^\text{17}\) On the other hand, pulmonary hydatid disease is widely spread in Turkey, and the incidence of its bilateral occurrence is 13%.\(^\text{7}\) For this reason, we have used a median sternotomy approach for bilateral pulmonary hydatid cysts since 1984.\(^\text{18}\) We performed 2-stage thoracotomies in 8 patients and median sternotomies in 6 patients with bilateral disease.

In patients with coexisting hydatid disease of the liver, especially cysts located within the right lobe and upper pole of the liver, the thoracic, transdiaphragmatic approach could be used to manage both the liver and the lung cysts.\(^\text{19}\) When the hepatic cyst is uncomplicated, it may be removed by simple enucleation and the cavity closed. If the cyst is infected with a bil-

## Conclusions

Procedures that conserve lung tissue are appropriate for most patients with pulmonary hydatid cysts, although there may be higher complication rates after these procedures than after excisional surgery. After removal of the cyst, the pericystic cavity should be obliterated to prevent secondary infection. Lung tissue resection should be used only when indicated. The immediate and late results of endocystectomy either by enucleation or aspiration are excellent. Enucleation is the ideal method for small or moderate-sized peripheral cysts, but rupture of the cysts should be avoided if the method is performed. In our clinic, we prefer removal of the cyst after needle aspiration and capitonnage for large, central cysts because it is a fast and effective technique with limited postoperative complications.

### References

6. Peleg H, Best LA, Gaitini D. Simulta-