Thoracic Hydatid Echinococcosis*
Diagnosis and Treatment

JORGE A. TAIANA, M.D., F.C.C.P.**
Buenos Aires, Argentina

Hydatid echinococcosis is produced by the larval or hydatid state of the echinococcus granulosus.† It corresponds to an intermediate phase of the parasite that in its adult stage inhabits the intestine of dogs. The egg of the echinococcus granulosus enters into the child through the mouth. The embryo, contained in the egg, penetrates the intestinal wall and enters the blood stream and subsequently lodges in the liver, lungs or other viscera. The embryo transforms itself into a larva: hydatid, characterized by a membrane and fluid matter. The fertility of the hydatid is a result of the presence of scolices capable of producing secondary echinococcosis. Hydatids produce in some organs, such as the lungs, a fibrous vascular tissue, which envelops them, called adventitia. Hydatid and the adventitia constitute a hydatid cyst. Bones do not form adventitia around the hydatid and therefore bone hydatidosis is not of a cystic nature.

Primary echinococcosis is the hydatid resulting from the larval hydatid of the hexacanth embryo that has reached an organ through the blood stream.

Secondary echinococcosis results from the rupture of a hydatid of primary echinococcosis with further hydatid development of scolices or junior vesicles turned loose by the rupture. It includes also the secondary microvesicles developed through germination or exogenous vesiculation of the bone hydatid.

Complications: The hydatids may break and their components disseminate into the neighboring tissues, serous cavities, arteries and bronchial tubes, etc. Pyogenic infections, tuberculosis and neoplasms may develop on the walls of the cavities containing hydatids or in the neighboring tissues.

Thoracic echinococcosis through hydatids arising from abdominal viscera. Hepatic echinococcosis, as well as splenic and renal, may spread and involve the diaphragm and enter into the thoracic cavity. This penetration produces different pathologic situations: pleural, pleuro-pulmonary, pericardial, hepato-pleural fistule, hepato-bronchial fistule, etc. In hepatobronchial fistule expectoration of bile is observed.

Topography

Lungs.

Primary hydatid echinococcosis appears as single or multiple cysts. The larva of the parasite, originally intact, may keep this characteristic or it may be found broken at the moment of the examination. The rupture of the larva determines whether part or all of the fluid content and part or all of the parasitic membrane may be evacuated from the lung where it was lodged. The evacuation takes place through the bronchi or towards the pleural cavity. Secondary local echinococcosis (intra-adventitial, in the adjacent zones, in the bronchi) and at a distance, through the blood vessels.

Pleura.

Primary echinococcosis is very rare. It presents two forms: autotopic and heterotopic. Secondary echinococcosis results from the rupture of a cyst (pulmonary, hepatic splenic, renal) or invasion of a bone hydatidosis (vertebral, sternal or costal). The displacement, total or partial, of a hydatid with junior vesicles is called hydatido-pleura. The isolated penetration of the fluid, without junior vesicles is called
THORACIC HYDATID ECHINOCOCCOSIS

Hydato-pleura. Hydatid chole-pleura: Bile plus hydatid elements. The presence and development of fertile elements determines the hydatid pseudo tuberculosis, involutive or evolutive. The latter can be responsible for multiple and isolated cysts many years later.

Mediastinum.

Primary and secondary echinococcosis: Bone hydatidosis is the most common cause of the secondary echinococcosis of the mediastinum.

Heart.

Primary echinococcosis is most frequently produced in the left ventricular myocardium and in unusual cases in the endocardium. Secondary echinococcosis follows rupture of a primary cyst and its spread to neighboring tissues. Rupture of the hydatid into one of the chambers of the heart may produce secondary echinococcosis through the lesser or greater circulation, depending on whether it breaks into the cavities of the left or the right side of the heart.

Pericardium.

Secondary echinococcosis is produced by the rupture of a cyst of the myocardium, the lung or an abdominal cyst of upward progression followed by penetration into the pericardial sac. Hydatido-pericardium is due to presence of fluid and junior vesicles from the primary hydatid. Hydato-pericardium is due to the presence of hydatid fluid only. Hydatid chole-pericardium is due to bile plus hydatid elements. As in the pleura, the presence of fertile elements may result in hydatid pseudo-tuberculosis, involutive or evolutive, and the latter may be multiple and produce isolated cysts. Chronic constrictive pericarditis has been observed as a complication.

Diaphragm.

Primary echinococcosis is very rare. Secondary echinococcosis may be produced by primary hydatids from pulmonary or abdominal sources.

Thoracic wall and mammary gland.

Primary echinococcosis: cysts are located in the subcutaneous cellular tissue and

Figure 1

Figure 1: (Case 1) Primary hydatid echinococcosis of the right pulmonary lower lobe in a 25-year-old man. Figure 2: (Case 1) Artificial pneumoperitoneum. Lateral view. The patient was treated by lobectomy.
in the muscles. Secondary echinococcosis: hydatids originate from bone echinococcosis (vertebra, rib, sternum). They often have the appearance of primary echinococcosis. Hydatids develop in the thoracic wall as the result of fertile elements implanted during operations.

**DIAGNOSIS**

Definitive diagnosis is made when scolexes or pieces of parasitic membrane are found. Some pulmonary hydatid cysts show characteristic x-ray pictures as reported by others: Modifications of the shape and the size of the radiologic shadow according to the respiratory movements; or a rounded shadow with a notch; bronchial separation; perivascular neuma; double-dome arch; rounded shadow in the antero-posterior view or polygonal shadow in the lateral view; or finally a camalote formation.

Calcifications are often found in old cysts of the liver, spleen and kidneys, but never in cysts of the lung.

Pneumothorax and pneumoperitoneum facilitate the topographic orientation. Bronchography and fistulography are often necessary in order to establish the alterations produced by cysts as they grow. The intradermal test of Casoni, the complement fixation test (Imaz-Appathie-Lorentz) and/or eosinophilia are not useful to prove the diagnosis.

**TREATMENT**

Objectives:
To evacuate the parasite; to obliterate the cavity where the parasite was lodged.

Surgical tactics, involve the following:

Ample surgical access for the treatment of all the existing cysts and enough space to accomplish the indispensable manipulations. Sudden rupture of the hydatid and consequent contamination of neighboring tissues or passage of parts of the parasite into serous cavities, bronchial tubes and/or blood vessels should be carefully avoided; aspiration of the fluid content of the hydatid and its gradual substitution with sulfuric ether, (2 per cent solution of formaldehyde or Dévé-Guerbet's solution.

**FIGURE 3:** (Case 2) Primary multiple hydatid echinococcosis of the right lower lobe in a 20-year-old man. The patient was treated by lobectomy.
to reduce the vitality of the fertile elements); adequate exploration of the cavity where the hydatid was lodged to verify its complete evacuation; extirpation of the cystic wall (adventitia), when this is possible, or extirpation of its emergent and nonrecuperative portions. The complete extirpation of the cystic wall may make it necessary to sacrifice a part of, or the whole organ: pulmonary lobe, spleen, etc.; it is necessary to restore the anatomic and functional integrity of the parasitized organs and of the thorax, through eradication of intra-pulmonary cavities and pulmonary expansion. Hydrodisisis of the bone requires resection of the bone (vertebra, rib, sternum). The technical difficulties may impose emergency procedure such as drainage and curettage.

**Tecnic**:

**Lung**: ample surgical exposure.

(a) *A hydatid cyst with intact larva* requires aspiration with a fine needle and gentle aspiration with a syringe and partial replacement of the hydatid fluid by sulfuric ether. Once the internal tension of the larva has diminished, a trocar is introduced in the cyst in order to continue the aspiration of the parasitic elements. Cystotomy is followed by the aspiration of the remaining fluid and residual portions of the parasitic membrane. Inspection is made of the cavity in order to ascertain complete removal of the parasite and treatment of the walls is instituted with sulfuric ether or 2 per cent formaldehyde solution.

**Treatment of the cavity where the parasite was lodged.**

Cavities ranging from 1 to 5 cm. in diameter, of elastic walls, without bronchial openings, can be treated by suture of the borders of the adventitious membrane.

For the remaining cavities, an economic pulmonary resection should be performed; and should be cuneiform, partial segmentary or lobular, according to the size, location and association with bronchopulmonary lesions.

(b) *Hydatid cyst with broken*, partially or totally evacuated larva, having infected adventitious cavity requires cystotomy in order to evacuate residual portions of the parasitized membrane and inspection of the cavity and treatment of the walls with sulfuric ether or 2 per cent formaldehyde solution.

**Treatment of the cavity where the parasite was lodged** is similar to that indicated for serous cysts and chronic pulmonary pyogenic abscesses. It requires pulmonary resection, usually lobular but may require pneumonectomy in multiple cysts for ex-

![Figure 4: (Case 2) Right lower lobe with two hydatid cysts.](image-url)
tended and irreversible pulmonary lesions, tuberculosis or cancer in the same lung.

**Pleura-pericardium.**

*Hydatid pleura, hydatido-pleura, hydatid o-pericardium, hydatido pericardium.* Requires evacuation of the pleural fluid or the pericardial fluid, evacuation of the parasite and treatment of the cavity where the parasite was lodged (lung, liver, etc.), including pulmonary decortication, pulmonary resection, and treatment of the multiple and isolated cysts and finally pericardectomy.

**Mediastinum.**
(a) *Primary echinococcosis.* Evacuation of the larva and suture of the adventitia or block resection in the cyst both larva and adventitia.

(b) *Secondary echinococcosis.* Includes, evacuation of the hydatids and drainage.

**Heart.**
Evacuation of the hydatid and reconstruction.

**Thoracic wall, mammary gland, diaphragm.** The condition requires evacuation of the parasite and suture of the adventitia or block resection.

**Bones (vertebrae, ribs, sternum).** Surgical intervention includes extirpation of the parasitic bone or segment. Technical difficulties may necessitate emergency procedures such as evacuation of the hydatids, bone curettage, and drainage. The bone pseudo-abscesses, consequent to hydatidosis of the bones, cause a great number of atypical operations.

**Liver, spleen and kidney. (Cysts of thoracic evolution).** The following measures apply: treatment of the cysts through thoracic route, evacuation of the parasite and drainage of the cavity; splenectomy, when technically advisable, pulmonary decortication, sometimes pulmonary resection; and pleural drainage.

**Secondary pulmonary echinococcosis.** Essential measures:
(a) *Bronchogenic.* Treatment of the primary hydatid cyst; destruction and bronchoscopic aspiration of the endobronchial hydatids, and eventual appropriate pulmonary resection.

(b) *Hematogenic.* Treatment of the secondary pulmonary cysts with conservative
criterion. When the primary hydatid is located in the heart, liver or a bone, pertinent treatment is imperative.


(1) Secondary hydatid echinococcosis: includes (a) local (intra-adventitious; intraparenchymatous; adjacent zones; and bronchial tree); (b) distant through the blood; (c) operative contamination,

(2) anaphylactic reactions.

(3) flooding of the bronchi by the hydatid fluid and portions of the membrane.

(4) residual cavity, chronic infection and hemorrhage.

SUMMARY

Thoracic echinococcosis comprises parasitic involvement of the lungs, mediastinum, heart, pleura, thoracic wall (muscles, vertebrae, ribs), diaphragm and breasts.

Solitary or multiple hydatid cysts, their pathologic appearance, primary or secondary echinococcosis, complications and thoracic invasion from hydatid cysts which originally developed in abdominal organs have been considered.

Surgical treatment, the only efficient treatment, should provide total evacuation

TABLE 1—Primary Hydatid Echinococcosis—Pathology

<table>
<thead>
<tr>
<th>Dog</th>
<th>Echinococcus Granulosus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Egg (embryo)</td>
</tr>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Alimentary Canal</td>
</tr>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Liver 53%</td>
</tr>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Lungs 29%</td>
</tr>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td></td>
<td>Other organs 18%</td>
</tr>
</tbody>
</table>

Adult stage of the parasite in the small intestine of dogs.

Through the blood

Larval stage of the parasite in human tissue.

TABLE 2

Primary Hydatid Echinococcosis

Propagation

Local

Canalicular

By blood

Inside the adventitia adjacent zones gemmation

Inside the same organ, apparatus or system

Bronchus bile ducts ureter

Secondary Hydatid Echinococcosis

In other organs

In the same organ, apparatus or system

Downloaded From: http://journal.publications.chestnet.org/pdffileaccess.ashx?url=/data/journals/chest/21427/ on 06/24/2017
of the parasite and the elimination of cavities where the parasites were lodged for a long time.

Surgical procedure varies according to individual cases.

Surgical technique requires refinements to obtain healing and to avoid parasitic surgical contaminations.

ADDENDUM: (1) Dévé-Guerbet’s Solution. (A) Potassium Ferricyanate 2 grams, water 970 ml. Should be sterilized in autoclave 10 minutes at 105°C. (B) Formaldehyde 20 grams, Acetic Acid 10 grams. (A) and (B) should be mixed at the time of surgical intervention. (2) According to M. Makkas, there are in Uruguay 17; Cyprus 13; Greece 7; Chile 7; Argentina 3 patients with hydatid cyst per 100,000 population.

RESUMEN
La equinococosis torácica comprende localizaciones parasitàrias en los pulmones, mediastino, corazón, pleura, pared torácica blanda, pared torácica ósea (columna vertebral, costillas), músculo diafragma y mamas.

Las características morfológicas, la localización de quistes únicos o múltiples, el carácter primario o secundario, las complicaciones y, finalmente, la penetración en la caja torácica de quistes originados en órganos abdominales son examinadas.

El tratamiento quirúrgico, único eficiente, debe contemplar la evacuación total del parasito y el destino de las cavidades consecutivas a la presencia parasitària durante numerosos años.

La táctica quirúrgica es diversa según las características de la enfermedad en cada caso individual.

La técnica quirúrgica requiere ciertos refinamientos para obtener la curación e impedir las contaminaciones hidálicas operatorias.

ZUSAMMENFASSUNG
Der thorakale Echinococcus umfaßt parasitäre Lokalisationen in den Lungen, dem Mediastinum, dem Herz, der Pleura, der Brustwand (Muskel, Wirbel, Rippen), dem Zwerchfell und der Brustdrüse. Solitäre oder multiple hydatide Cysten, deren pathologisch-anatomische Erscheinungsform, primäre oder sekundäre Echinococcus, Komplikationen und thorakaler Befall, ausgehend von hydatiden Cysten, die sich ursprünglich in den Baucheingeweiden entwickelten, wurde abgehandelt.

Die chirurgische Behandlung als das einzig wirksame Vorgehen, muß auch eine Beseitigung des Parasiten und der Höhlin einschließen, in der sich die Parasiten für längere Zeit aufgehalten haben.

Im einzelnen differiert die chirurgische Methode entsprechend dem individuellen Fall. Die chirurgische Methode erfordert immer ein sehr sorgfältiges Vorgehen, um eine Heilung zu erzielen und parasitäre chirurgische Verunreinigungen zu vermeiden.

REFERENCES
3 Ivanissevich, O.: "Tratamiento de los Quistes Hidatídicos del Pulmón" X Congreso Argentino de Cirugía, 1938.