The Treatment of Intrathoracic Hydatid Disease*, **

REEVE H. BETTS, M.D., F.C.C.P. and T. THOMAS, M.B.B.S.

Vellore, India

Hydatid disease is of comparatively frequent occurrence in Australia, New Zealand, Iceland, Greece and South America. It is endemic in India and, although not of great frequency, it must be considered in the differential diagnosis of any intrathoracic cystic lesion or in any irregular enlargement of the liver.

The proportion of lung to liver hydatids appears to vary in different countries from 60 per cent pulmonary in certain series to as low as 7 per cent in others. Waddle1 has summarized the material from the Louis Barnett Hydatid Registry of the Royal Australasian College of Surgeons; 478 cases of pulmonary hydatid disease have been reported to the registry from Australia and New Zealand and of these 10 per cent also had liver involvement. He quotes Devé2 who showed experimentally that hydatid embryos could reach the mediastinal-lymph nodes without going thru the liver. The comparatively low incidence of associated liver and pulmonary lesions makes some such explanation seem plausible. It seems likely that many hydatids do pass thru the liver to reach the lung. As pulmonary hydatids are often asymptomatic until they develop complications or attain considerable size, the number of pulmonary cases detected is proportional to the frequency of chest roentgenological examination. Beckman3 published 13 cases from Sweden, eight of which had pulmonary involvement, and pointed out that five of the eight were discovered in tuberculosis dispensaries where free use is made of roentgenological examination.

Pulmonary hydatids may be divided into two categories, simple and complicated. The simple are those without exogenous daughter cysts or bronchial communication while the complicated ones include those with only a part of the cyst wall and contents is expectorated and a bronchial or pleural communication with or without sepsis.

Pulmonary hydatids may attain large size without any demonstrable bronchial or pleural connection. Such communications occur spontaneously or after some blow or injury to the chest. Although we have had no such experience, apparently the entire cyst may be expectorated and the patient thus cured. This fortunate phenomenon occurred in 36 of Waddle's1 cases and all but one apparently have no residual symptoms. Frequently only a part of the cyst wall and contents is expectorated and a bronchial fistula persists with superimposed infection. Rupture into the pleural space causes empyema and may produce a severe anaphylactic reaction. As the treatment of uncomplicated hydatid disease is satisfactory, the simple

*From the Department of Thoracic Surgery, Christian Medical College & Hospital, Vellore, South India.

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cysts should be treated before becoming complicated.
Twenty cases have been treated on our service during the last three years and are the basis of this report.

Diagnosis

An awareness of the possibility of hydatid disease is an important factor in correct diagnosis. In our earlier cases the diagnosis was missed preoperatively in most as we had not considered carefully enough the possibility of hydatid disease. It must be thought of in any cystic lesion of the lung and the greater the incidence of the disease, of course, the more likely the possibility.

The history is pathognomonic only in those instances where the cyst or its contents has been expectorated, but in other instances suggestive symptoms are forthcoming. In contrast to other cystic lesions, hemoptysis, usually manifest only as streaking of the sputum, has been comparatively frequent even in those cases with no evidence of bronchial communication. This symptom has commonly been held to be indicative of a bronchial communication, but it also probably may be due to a hemorrhagic reaction around the cyst.

In only one of our cases was a history obtained of expectoration of cyst elements. In that one instance the history was unmistakable as the patient stated she frequently coughed up “small bag-like things like the white part of an egg.”

Pain has been present frequently. It has not been necessarily in proportion to the pleural reaction noted at operation. Purulent sputum has indicated either an infected cyst or associated bronchiectasis.

The physical examination of the patient has not been helpful in arriving at the proper diagnosis in so far as the specific pulmonary signs are concerned. What has been of help has been the surprisingly good general appearance of most of patients in spite of extensive processes by x-ray inspection. For example, the patient Mrs. R., Case 3, was thought preoperatively to have a large metastatic tumor of the left lower lobe of the lung. Yet she appeared to be in good general condition. This finding should have made us suspect a benign rather than a malignant condition.

Roentgenological study is, of course, the most important method of diagnosis. The various projections usually reveal an apparently cystic mass or masses and frequently some lobulation can be demonstrated. It should also be remembered that hydatids may cause bone erosion by pressure and therefore they may be thought to be malignant.

Other cystic lesions, such as bronchial cysts, pericardial cysts and reduplications of the intestinal tract, are found near the mediastinum in most instances. Hydatids may be present in the same location, but also are frequently more peripheral in the pulmonary parenchyma and may even be wholly in the pleura itself. (Case 2).

Laboratory studies are of considerable value, the most important being the Casoni skin test. The necessary material for testing was not available during the early part of our series and our attempts to make some from the cysts removed at operation were not successful due to contamination.
In those instances where we have done the test preoperatively a positive reaction was obtained in about 70 per cent, and we have not encountered any false positive ones in our short experience.

Eosinophilia may or may not be present. The eosinophils have not been strikingly elevated in any of our cases. In only three of the 20 was the percentage above 12, the two highest being 40 per cent of a 5,800 white blood cell count and the other 28 per cent of a 11,000 count. The level obtained is about the same as that found in other parasitic infestations and as many of our patients have other parasites as well the eosinophilic level has not been of much help.

Aspiration of the cyst by thoracentesis is contraindicated as it may be followed by an anaphylactic reaction, or fluid may leak along the needle tract into the pleural space and disseminate the parasites. Little is to be gained by aspiration. If hydatid elements are found, surgical treatment is indicated. If they are not found, the lesion should be removed in the absence of definite contraindications as simple abnormalities are best corrected while they are simple.

Pneumothorax is rarely a help as it cannot give much information beyond that which is already known, that is, there is a cystic mass in the lung. It does indicate the presence or absence of adhesions, but this is better determined surgically.

Bronchoscopy and bronchography are often used as diagnostic aids, but we have not been impressed with their value as they simply indicate extrinsic pressure on the bronchus. Bronchography is helpful in determining the presence of any associated bronchiectasis or other concomitant lesion. It is usually a good plan to bronchoscope any patient before doing a thoracotomy, but bronchography need not be done routinely.

Treatment

Except for the rare case that expectorates the cyst with its lining complete, practically all cases need surgical treatment. The only method of medical management of which we are aware is the report of Castex and Captehouratel. They propose formation of pleural adhesions, when these are not already present, and then transpulmonary injections of various substances into and surrounding the hydatid. By the hydrostatic effect as well as the irritant action of the material injected coughing is increased and the cyst contents evacuated thru the bronchus! In their report they state they have cured various types of hydatids, both those with previous bronchial communications and those without. No figures are given, however, as to the number of cases treated or those in which the treatment was not effective. They infer that all cases have been successful. In most instances the course of injections extended over many months and it does not appear to be an acceptable method of treatment.

There are two main methods of surgical management. The more frequent type of treatment, according to reports in the literature, is by evacuation of the contents of the cyst and then either draining, marsupializing, or closing tightly the pericyst cavity. The older method was to do this in one stage if pleural adhesions were present or by a two stage method
if adhesions were not found. There is less fear of open pneumothorax or of purulent pleural complications now, so the two stage plan is used infrequently. The more recent reports of those that advocate evacuation of the hydatid advise open thoracotomy if the pleura is free. The pleural cavity is protected with packs, the contents of the cyst aspirated and then the cyst wall is removed. The outer lining is either closed or drained depending on local conditions. Many believe that formalin should be instilled into the cyst before it is removed to kill any living parasites. It has one disadvantage and that is the rather violent reaction that takes place if any of the formalin gets into the bronchus or pleural cavity. In a recent article Barrett and Thomas record their experience in some 71 cases. Although they formerly resected most hydatids they now advocate evacuation without aspiration. It is their belief that in most instances even the large cysts do not produce any permanent pulmonary damage and the pulmonary tissue should therefore be preserved.

Marsupialization of the cyst wall to the thoracic wall was often employed a few years ago. Such spaces were a long time in obliterating and this type of operation is not employed now except in some instances with superimposed infection. Even many of the infected cases can be closed with or without drainage due to antibiotic protection, and thus prolonged morbidity may be eliminated.

In recent years, since pulmonary resection has become commonplace for other intrathoracic lesions, excision has been used more frequently for some types of hydatids. For those of extensive size where practically all of a lobe has been destroyed or when accompanied by pulmonary suppuration, removal of the lobe has been employed with good results. However, one should not sacrifice a whole lobe for a cyst of moderate size that has really but little pulmonary damage. Pulmonary hydatids are often multilobar which is another reason for not treating the smaller ones by lobectomy. If the cyst is treated by evacuation the pericystic wall which is laid down by the host remains and this is the "empty sac" that may lead to complications. Barrett and Thomas state that this pericyst can also be dissected out and removed if indicated. We have not been successful in this maneuver.

The ideal operation would consist of intact removal of the cyst and the surrounding host membrane without sacrifice of normal lung tissue. The operation of segmental resection, as now practiced, nearly achieves this ideal. Newer anatomical studies of the lung have elucidated the subdivision of lobes into lobules or bronchopulmonary segments. Each lobe of the lung is composed of a definite number of these segments (the number depending on the lobe under consideration) each of which has its own bronchus, arterial and venous channels. Those structures are quite constant except for certain minor normal variations. Applying the knowledge of this newer anatomy to actual surgical experience enables the removal of any one or combination of bronchopulmonary segments. The diminution in pulmonary function from loss of any one of these segments is comparatively small and is not to be compared with the diminished pulmonary function following pleural thickening or thoracic wall immobiliza-
tion following a long pulmonary drainage. The operation of segmental pulmonary resection would therefore seem to be adaptable to the treatment of pulmonary hydatid disease, permitting as it does, complete removal of the parasite and its surrounding membranes but with little loss of functioning pulmonary parenchyma. However, it has been possible to utilize segmental resection in only four of our cases.

Brewer, Jones and Dolley* state, “Since the best treatment for echinococcus disease is pulmonary resection, if the condition of the patient permits, pulmonary resection is the procedure of choice.” Susman* in a recent article takes exception to this statement. Being an Australian surgeon he no doubt has had a rather large experience with this condition although he does not give his figures in this last report except to state that he had had 12 additional cases since a previous report published in 1948. His earlier paper is not available to us. Susman states that “lobectomy may be necessary for the following conditions:

1. Serious hemorrhage from the cyst space during a conservative operation.
2. Residual bronchiectasis, if symptoms warrant it.
3. Empty sac, if hemorrhage or infection warrants it.
4. When the diagnosis is uncertain.
5. Giant cyst.”

In his last article he strongly supports the “conservative” treatment and reports two cases with infection that were treated by evacuation of the cyst but without drainage. No complication ensued.

Our experience with hydatid disease has been limited to 20 cases treated during the past three years. The surgical management of the simple or uncomplicated ones has not presented any major difficulties as all 12 did well following resection. In one, the only one limited to the pleura, simple excision was all that was needed. Seven were treated by lobectomy, two by segmental resection, one by lobectomy and segmental resection and one by bi-lobectomy.

The cases with associated complications such as involvement of the pleura or transdiaphragmatic communications with hepatic hydatids have been difficult problems. Patients with separate hydatids of the lung and liver can be treated as for each infection alone. We have preferred to treat the lung lesion first as the associated liver hydatids were not large in two of our cases, but in one with large liver cysts the abdominal lesion was treated first. In this case two cysts were evacuated abdominally and a third large one in the superior surface of the liver was evacuated transdiaphragmatically at the time of middle lobectomy for the pulmonary hydatid.

The most difficult problems have been the three cases with transdiaphragmatic communications between the liver and lung. In two instances this was on the right, while in one it was on the left. In the latter instances we are not sure whether the infradiaphragmatic hydatid abscess was really hepatic or only subdiaphragmatic as this patient had been operated on twice before for abdominal hydatids and multiple cysts could be palpated throughout the abdomen.
In all three combined cases the liver hydatid was grossly infected at the time of operation and all were drained subcostally as well as thoracically. Long periods of hospitalization were necessary in these three cases and in two of them drains were still in place in the subdiaphragmatic region at the time of discharge.

In only one of our cases were hydatids present in both lungs. A resection of the right middle lobe and superior segment of the right lower lobe was done without incident, but the patient has not returned for treatment of the cyst on the left side.

Case Reports

Case 1: C.M.C.H. 95902, Mrs. V., an 18 year old married woman entered the hospital on August 23, 1949, having been referred by Dr. J. Frimodt-Møller of the Union Mission Tuberculosis Sanatorium, Arogyavaram. Her present illness had started three months previously with a fever of low degree. This continued for five or six weeks. During this time she was given a course of streptomycin (exact amount unknown) although no chest x-ray was taken during this period. After the fever had subsided she had no complaint except for generalized weakness. There was no cough, sputum or hemoptysis. She had noticed a sensation of discomfort over the lower right chest and in the epigastrum. Because of her generalized weakness she presented herself at the Sanatorium for investigation as she had been told that she had pulmonary tuberculosis. Studies there revealed a mass in the superior segment of the right lower lobe, Fig. 1 A and B. The lesion was not entirely spherical, but appeared to be somewhat lobulated and was thought to be cystic. An assistant aspirated the chest in that area and removed two ounces of clear fluid which was studied both chemically and culturally without finding any points of diagnostic significance. Hydatid elements were looked for specifically but not found. Fortunately there was no untoward reaction from the aspiration. She was referred to this hospital for treatment. Physical examination at the time of admission revealed a well developed and nourished young woman in no acute distress. The abnormal physical findings were limited to the right chest where there was evidence of a small pneumothorax and a small amount of fluid in the right pleural cavity. Her temperature, pulse and respirations were within normal limits. Laboratory examination revealed hemoglobin 12.25 gms., white blood count 10,000, the differential showing polymorphonuclears 52 per cent, lymphocytes 26 per cent, monocytes 2 per cent and eosinophils 20 per cent. The Kahn test was negative and her sedimentation rate was 30 mm. The first hour and 70 mm. the second hour. Urine and stool examination showed no abnormalities. A tentative diagnosis of bronchial cyst was made and exploratory thoracotomy was advised.

On August 29, 1949, with the patient in the prone position and under procaine paravertebral block and light ether endotracheal anesthesia, the right thorax was opened thru an intercostal incision. 200 cc. of slightly turbid fluid were found in the pleural space. The superior segment of the right lower lobe was replaced by a cystic mass 7 cm. in diameter. In some parts the cyst was covered by lung and in others a greyish wall was exposed. By blunt dissection an attempt was made to separate the mass from the surrounding lung, but in so doing the cyst was ruptured at the point where it had been aspirated. On opening the cyst a small bronchial fistula was discovered. Believing it to be a bronchial cyst, a segmental resection was done, removing the superior segment of the right lower lobe. This separation was carried out without difficulty. There was little leakage of air or blood from the remaining basal segments. The bronchus was closed, with one row of interrupted cotton sutures and reinforced with a flap of pleura. The chest was washed out with saline and drained with one tube posteriorly. She was returned to the ward in good condition, with a blood pressure of 108/70.

Her postoperative course was essentially uneventful. She had a temperature up to 101° F., the first two postoperative days after which it gradually subsided, reaching normal on the sixth postoperative day. She was discharged on the 14th postoperative day. She has remained well since operation and her x-ray film on September 17, 1949, is shown in Fig. 1 C. The pathologic examination of the removed segment revealed two sacs of equal size, one a thick fibrous wall and the other white and gelatinous. Microscopically the structure of the wall was that of an hydatid cyst. There was no evidence of any living parasites.

Case 2: C.M.C.H. 97297, Mr. T., a 35 year old married cooly, was admitted to the hospital on October 25, 1949, because of pain in the left chest of three months' dura-
Figure 1 (A)—Case 1. Preoperative posteroanterior x-ray film of the chest showing a large, somewhat lobulated, mass in the right lower lung field. (B)—Right lateral x-ray film of the chest showing the mass to lie in the region of the superior segment of the right lower lobe. (C)—Postoperative x-ray film of the chest following removal of the hydatid by segmental resection of the superior segment of the right lower lobe.
tion. The onset of the pain was insidious and really began two years before admission, but had been much worse during the past three months. During the same two year period there had been some cough and expectoration. About every three to four months there were attacks of more severe cough, increased pain and frequently fever of moderate degree. During the past three months sputum had occasionally been brownish in color. Pain in the left shoulder had been gradually increasing making rest at night difficult.

Physical examination revealed a fairly well developed and nourished man in no great distress but complaining rather bitterly of pain beneath the left scapula. There was dullness over the upper part of the left chest posteriorly and quite marked tenderness to pressure. Breath sounds were diminished over the same area. The remainder of his physical examination was within normal limits. His temperature was normal, pulse 62 and blood pressure 90/60. X-ray film of the chest, Fig. 2, revealed

FIGURE 2—Case 2. Preoperative posteroanterior x-ray film of the chest showing a large cystic mass in the left upper chest.

a rounded mass in the left upper lung field posteriorly. The borders were well outlined and there appeared to be no infiltration of the lung. Further x-ray studies of the upper dorsal spine and ribs showed no evidence of erosion although the ribs seemed to be somewhat displaced by the mass. Laboratory examination revealed hemoglobin 16 gms., white blood cell count 4,000 with a differential showing polymorphonuclears 46 per cent, lymphocytes 43 per cent, eosinophils 6 per cent, basophils 1 per cent and monocytes 4 per cent. The sedimentation rate was 2 mm. the first hr. and 6 mm. the second hour. The urine was normal. Examination of the stools showed hookworm ova. A diagnosis of benign tumor of the left upper chest was made and he was advised to have it removed.

Because we considered the possibility of the lesion being a meningocele, he was operated upon in the lateral position under procaine paravertebral block and light endotracheal ether anesthesia. The usual left parascapular incision was made and the thoracic cage exposed. On doing so a soft, cystic mass was observed presenting between the third and fourth ribs. The fluid was aspirated and some sent for chemical examination, and another specimen to the pathologist. No hydatid elements could be found on microscopic examination. The fluid showed albumin 16 per cent, globulin 17 per cent, sugar 59 mg. per cent, protein 113 mg. per cent and chlorides 590 mg. per cent (subsequent report). A section of the fourth rib was removed and the cyst dissected out. It was found to lie apparently in the pleura as it was not attached at any particular point to the underlying lung. The cyst separated without difficulty from the lung and chest wall although at one place a small rent was made in the pleura. This rent was closed with interrupted sutures. The space was thoroughly washed out with saline and the wound closed in the usual fashion in layers with cotton. He was returned to the ward in good condition.

Postoperatively he had a smooth convalescence, the temperature returning to normal
Figure 3 (A)—Case 3. Posteroanterior x-ray film of the chest in 1945 when a diagnosis of carcinoma of the thyroid was made and subtotal thyroidectomy carried out. (B)—X-ray film of the chest five years later showing a large mass in the left lower lobe. (C)—Left lateral x-ray film demonstrating the mass to fill the lower part of the left chest.
on the third postoperative day and remained there until he was discharged on the
12th postoperative day. He was symptom free at the time of discharge but we have
been unable to follow him since that time. On examination of the removed specimen
it was found to be a typical hydatid cyst but without evidence of living parasites.

Case 3: C.M.C.H. 99818, Mrs. R., a 40 year old married woman entered the hospi-
tal on February 28, 1950, with a chief complaint of pain in the left chest and cough
with expectoration of five months' duration. She complained of feeling feverish in
the evenings during the past six months. There was slight anorexia and insomnia.
She was referred by Dr. Vadamalayam of Madura who supplied the additional in-
formation that he had first seen her in December 1945 when she consulted him regarding
an enlarged thyroid. An x-ray film was taken at that time which is reproduced in
Fig. 3 A. This revealed a circumscribed shadow in the lower left lung field. Thy-
roidectomy was carried out by Dr. Vadamalayam and the pathological report was
carcinoma of the thyroid. (An attempt has been made to secure the original slides
but they are no longer available). The lesion in the left lung field was therefore
regarded as a metastasis from the thyroid and she was advised to take deep x-ray
therapy. After two or three treatments she absconded and was not seen again until
1950 when she returned complaining of the above noted symptoms. An x-ray film
at this time (Fig. 3 B and C) showed the lesion greatly enlarged and practically
filling the entire left lower lung field. She was referred to this hospital with a diag-
nosis of solitary metastasis of the left lower lobe of the lung for consideration of
resection.

Physical examination at the time of admission revealed a well nourished woman
in no acute distress. The head and neck showed no abnormality except for a well
healed thyroidectomy scar. Examination of the thorax showed dullness throughout
the lower part of the left chest both posteriorly and anteriorly. No rales were de-
tected. The heart showed no abnormality; the blood pressure was 90/68. The re-
mainder of the physical examination was within normal limits. A preoperative exami-
nation of the blood showed hemoglobin 15.5 gms., red blood cell count 4.8 million,
white blood cells 8,700 with 64 per cent polymorphonuclears, 23 per cent lymphocytes,
10 per cent eosinophils and 3 per cent monocytes. Urine examination was normal
except for a few white cells. Further x-ray studies were carried out which gave a
little additional information, showing a large mass within the left lung field. Bron-
choscopy demonstrated almost complete occlusion of the left lower lobar bronchus
by extrinsic pressure. No intrabronchial abnormality was found.

With a preoperative diagnosis of carcinoma, metastatic, of the left lower lobe
thoracotomy was done on March 9, 1950, under procaine local and endotracheal ether
anesthesia. She was operated upon in the prone position and the chest was entered thr
the sixth left interspace. We were surprised to find the lower lobe completely
free within the pleural cavity. A small amount of turbid fluid was present. The
total lower lobe appeared to be replaced by a large cystic-feeling mass. It was
found possible to remove the lesion entirely by a lower lobectomy leaving the upper
lobe undisturbed. The lower lobe was therefore removed by the usual techni-

Now it is the time to discuss the 11th postoperative day when she had a temperature
of 101°. The following day it reached 102.2° and examination of blood at that time
revealed malarial parasites. Paludrine was given and the temperature promptly
returned to normal and remained there. She was discharged asymptomatic on the
16th postoperative day. An x-ray film taken on March 27, 1950, is shown in Fig.
3 D. Pathological examination of the removed lower lobe showed it to be entirely
replaced by a large hydatid cyst (Fig. 3 E and F). Many parasitic elements were
found.

Case 4: C.M.C.H. 98931, A.S. This 11 year old boy was first admitted to the hos-
pital on the pediatric service on January 14, 1950, because of chest pain and cough
of six weeks duration. He gave a history of having had a fall from a height of four
or five feet at the time of the onset of his symptoms and stated that he fell on
the left side of the chest. Symptoms from this gradually subsided, but returned after
another mild fall three weeks before admission. At that time his cough increased
and he expectorated a small amount of sputum. There had been no hemoptysis.
He found it difficult to lie on the left side. A low-grade fever had been present
for one examination at this time revealed a well developed boy in
noue distress. His examination was essentially normal except for the chest which
showed dullness and absence of breath sounds over the left lower posteriorly. Lab-
ory studies showed a hemoglobin 9 grams, white blood cells 17,200 with 80 per
cent polymorphonuclears, 16 per cent lymphocytes, and 4 per cent monocytes. The
sedimentation rate was 63 mm. in one hour and 95 mm. in two hours. The urine was normal. Examination of the stools revealed hookworm ova. A Mantoux test 1:10,000 was negative. No acid fast bacilli were recovered from the sputum or stomach contents. The Kahn test was negative. His temperature after admission was 101° to 102° daily, but gradually subsided to normal by the end of the first week. The left chest was aspirated on the sixth hospital day and 16 cc. of clear fluid were removed. The fluid was negative on smear and culture. X-ray films of the chest revealed an ill defined mass in the left lower lung field best visualized in the oblique view, Fig. 4 A and B. A diagnosis of diaphragmatic hernia was considered, but further studies revealed no such abnormality. Inasmuch as he became symptom free it was thought advisable to observe him for a time in the outpatient department before resorting to surgical treatment. He was therefore discharged on February 8, 1960, after having been treated for the hookworm infestation.

He returned to the hospital on March 13, 1960, because of increased cough along with some fever and the appearance of a small amount of blood in the sputum of three or four days' duration. Physical examination was essentially unchanged from the first admission. Repeated x-ray films showed no difference when compared with the previous films. Thoracotomy was advised and a preoperative diagnosis of cystic mass in the left lower lobe was made. Left lower lobectomy was done under endotracheal ether anesthesia on March 20, 1960. He was operated upon in the lateral position and the pleural cavity was entered thru the sixth intercostal space. A large mass was found in the left lower lobe which was adherent to the chest wall although the adhesions freed without much difficulty. The entire lower lobe seemed to be involved in the process and in the hilar area a large number of vascular lymph nodes were found. This was true not only of the lobar hilum but the pulmonary hilum as well. A lymph node removed for frozen section biopsy was reported as inflammatory. By careful dissection the lower lobar hilum was finally developed and the lobe and mass removed without opening the cyst. He was returned to the ward in good condition with a blood pressure of 90/70 but with a pulse of 160. Five hundred cc. of blood were given during the operation. He did well after the operation although he had a temperature of 104° on the day of operation. We believe this was a pyrogenic reaction from the intravenous saline he had been given. The temperature settled down and remained normal after the fifth postoperative day. He was discharged asymptomatic on the 14th postoperative day and immediately returned to school. His postoperative x-ray film is shown in Fig. 4 C. The pathological examination of the spec-

![Figure 4D](image)

**Figure 4 (A)—Case 4.** Posteroanterior x-ray film of the chest showing a diffuse haziness over the lower two thirds of the left lung field. (B)—Oblique x-ray film of the chest which more clearly demarcates the extent of the mass in the left lower lobe. (C)—Postoperative x-ray film following left lower lobectomy for hydatid. (D)—Photograph of the left lower lobe containing large hydatid cyst. (E)—Photograph of the left lower lobe after section.
Figure 5 (A)—Case 5. Preoperative x-ray film of the chest showing a lobulated mass in the lower part of the right lung field and also haziness near the apex of the right upper lobe. (B)—Right lateral x-ray film showing the mass in the lower chest to lie mainly anterior. (C)—X-ray film of the chest following segmental resection of the apical segment of the right upper lobe and evacuation of the pleural hydatids which communicated with the hydatids in the liver thru the diaphragm.
imen revealed it to be a cyst 8 cm. in diameter with a laminated membrane containing many scolices. The lung tissue of the lower lobe was markedly compressed. Photographs of the specimen are reproduced in Fig. 4 D and E.

Case 5: C.M.C.H. 107098, Mr. P. B. This 17 year old man was admitted to the hospital on January 9, 1951, with a chief complaint of pain in the right chest of three years' duration. He stated that the difficulty started with an attack of dysentery three years previously. The intestinal symptoms abated after three weeks, but the pain in the right lower part of the chest continued. The pain was rather severe in nature and almost constant. There was some radiation both to the back and to the opposite side. Although he had taken various types of treatment it was not until three months previously that he had been admitted into a hospital for investigation.

There had been breathlessness on slight exertion and he was conscious of palpitation. The cough and sputum had been minimal and he had noticed no blood in the sputum at any time.

During the past four years he had had frequent attacks of pain in the abdomen and various tests had been carried out without demonstrating any marked abnormality. A month before admission a lymph node was removed from the left side. The result of the examination is not known.

Physical examination revealed a well developed and nourished young man complaining of severe pain in the right chest. Examination of the head and neck revealed impaired hearing in the left ear. In the neck a movable nodule about 1 cm. in diameter was found in the region of the isthmus of the thyroid and a similar nodule just to the right of the midline. The thyroid appeared to be slightly enlarged to palpation. The nodule moved with the thyroid. On examination of the chest there was slight dullness toward the right base and over the apex, but no rales were heard. Both sides of the chest seemed to move equally. The heart was normal to examination and the blood pressure was 140/80. The liver and spleen were not palpable and there was no abnormality made out on examination of the abdomen.

Laboratory tests of the blood showed 11.75 grams of hemoglobin, red blood cell count 4.85, white blood cell count 11,400 with 54 per cent polymorphonuclears, 43 per cent small lymphocytes and 3 per cent monocytes. The Kahn test was negative and the sedimentation rate 12 mm. at the end of the first hour and 36 mm. at the end of the second hour. The sputum revealed no acid fast bacilli and no hydatid elements could be demonstrated. The Casoni test was positive. Examination of the urine showed nothing abnormal.

An x-ray film of the chest revealed multiple clear cut oval and round densities at the base of the right lung, and also haziness at the right apex. Fig. 5 A and B. A lateral x-ray film demonstrated that the masses previously described in the lower right chest were located anteriorly and one large calcified round lesion was noted apparently beneath the diaphragm in the liver.

Bronchoscopy showed no intrabronchial abnormality.

On January 23, 1951, right thoracotomy was carried out and the pleura was found to be studded with innumerable small hydatids mostly from 0.5 cm. to 1.0 cm. in diameter. In the lower part of the chest there were many larger hydatids two or three inches in diameter as visualized in the x-ray film, the largest one being 6 cm. in diameter. When the upper lobe was mobilized it was found that there was also a hydatid in the posterior segment of this lobe. This cyst was inadvertently opened in freeing it from the chest wall. Although it was thought at first that the lower hydatids were in the middle lobe it was found that they could be separated from the lobe and it then became apparent that they came up thru the diaphragm. The cysts were all taken out and in doing so a communication with numerous cysts in the liver was found and some of these liver cysts were grossly infected. The previously noted calcified cyst in the liver was easily located. All the subdiaphragmatic and liver cysts were evacuated and this area was drained subcostally, following which the diaphragm was closed. The posterior segment of the upper lobe was then removed in the usual manner. The chest was drained with two drains and closed in the routine fashion. He had a rather stormy convalescence running a spiking type of fever for about three weeks. This was thought to be due to improper drainage of the subphrenic area.

On March 29, 1951, under local anesthesia the two cysts were removed from the thyroid. It was thought that these might be hydatids, but pathological examination revealed them to be adenomas of the thyroid. The drainage tube was removed from the subphrenic area two weeks before discharge and he was allowed to go home on the sixth of April, 1952. Fig. 5 C.

Case 6: Mrs. K., C.M.C.H. 125876. This 48 year old married woman was admitted to the hospital on October 31, 1952 with a history of productive cough and dyspnea of seven months' duration. She stated that these symptoms followed a short febrile incident lasting three or four days and she first consulted the medical outpatient department of this hospital on July 9, 1952. At that time a diagnosis of a hydropneumo-
Figure 6 (A)—Case 6. Preoperative x-ray film of the chest showing a complete pneumothorax on the left side with complete collapse of the left lung. The lung could not be made to re-expand by repeated thoracentesis. (B)—X-ray film of the chest following insertion of a catheter for suction drainage which likewise did not re-expand the lung. (C)—X-ray film of the chest following left pneumonectomy. (D)—Photograph of removed left lung showing hydatid in the left lower lobe which had ruptured into the pleura. The hydatid membranes are extruding thru the visceral pleura. In spite of this there was no fluid in the chest and no signs of any infection.
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Thoracic surgery was carried out on October 17 at which time fluoroscopic examination showed the left lung to be completely collapsed and a small amount of fluid in the left costophrenic angle. Admission was advised, but not effected until October 31, 1952.

Physical examination showed a middle aged woman with considerable dyspnea, cough and a small amount of thick purulent sputum. She was moderately dyspneic even at rest. There was no cyanosis or clubbing of the digits. The trachea was markedly displaced to the right. The left chest moved little with respiration. Fremitus was absent. Percussion revealed hyperresonance on the left side with absent breath sounds. The right lung field was clear.

Laboratory examination revealed hemoglobin 12 grams, red blood cell count of 4.86 million and a total white count of 14,500. Polymorphonuclears were 60 per cent, lymphocytes 29 per cent, eosinophils 9 per cent and monocytes 2 per cent. The blood sedimentation rate was 26 mm. in the first hour and 46 mm. at the end of the second hour. The blood Kahn was negative. Urinalysis and stool examination revealed no abnormality. Repeated examinations of the sputum were negative for acid fast bacilli.

Fluoroscopic and x-ray films revealed complete collapse of the left lung with marked displacement of the mediastinum to the right side. Fig. 6A. No detail of the left lung could be made out. Aspiration of 2,000 cc. of air failed to change the position of the left lung.

Methylene blue was injected into the left pleural space but was not brought up in the sputum. Inasmuch as repeated aspirations did not change the status of the lung an intercostal catheter was inserted in the left chest on November 2. This was attached to under-water suction, but did not effect much expansion of the lung although the mediastinum did return to the midline. In view of the lack of progress, thoracotomy was advised and carried out on November 11, 1952. Exploration revealed a small amount of fluid in the left chest and a moderately large hydatid cyst of the left lower lobe which had ruptured thru into the pleural space exposing some of the hydatid membrane thru the opening. A left lower lobectomy was carried out and the upper lobe decorticated. However, it was not possible to achieve expansion of the upper lobe even after complete decortication and the pneumonectomy was therefore completed.

She had an uneventful postoperative course. A Casoni test done after operation showed it to be strongly positive. She had an uncomplicated postoperative course and was discharged on November 30, 1952. A photograph of the specimen is shown in Fig. 6D.

![Figure 6D](http://journal.publications.chestnet.org/pdaccess.ashx?url=/data/journals/chest/21255/ on 06/26/2017)
FIGURE 7A  FIGURE 7B  FIGURE 7C

Figure 7 (A)—Case 7. Photograph of patient on admission to the hospital showing a mass just to the right of the epigastrium. (B)—Posteroanterior x-ray film of the chest showing a large mass in the right mid zone. (C)—Right lateral x-ray film of the chest demonstrating the mass to lie anteriorly. (D)—X-ray film of the chest following right middle lobectomy. (E)—Photograph of patient at time of discharge showing the abdominal and the thoracic incisions for removal of the cysts in the liver and lung.
Case 7: C.M.C.H. 124961. This six year old girl was admitted to the hospital on September 29, 1952 because of a mass in the upper abdomen of gradually increasing size of four months' duration and fever for two weeks. Five months before coming to the hospital she complained of vague abdominal pain, anorexia and lethargy. The symptoms continued unabated and four months before admission the parents first noted a mass in the upper abdomen. A diagnosis of cirrhosis of the liver was made and she was treated with methionine, liver extract and vitamins. All her symptoms gradually increased in degree.

Two weeks before admission she struck her upper abdomen against the corner of a table. She developed fever the following day and the mass in the epigastric region began to increase rapidly in size and her fever rose progressively. She also had a slight cough the last week before admission.

The past history of the family was non-contributory except that the family did have several dogs which were allowed in the house.

Physical examination revealed a thin, six year old girl moderately dyspneic and apparently acutely ill. The positive findings were limited to the chest and abdomen. Percussion of the chest showed it to be impaired in the lower right chest anteriorly and in the axilla. Breath sounds were diminished in the same area. Examination of the abdomen revealed a rounded mass four to five centimeters in diameter which was visible as well as palpable in the epigastrium. Fig. 7 A. No thrill could be made out. The liver was apparently much enlarged, the inferior margin being 6 cm. below the costal margin.

Laboratory examination revealed hemoglobin 10 grams, white blood cell count 15,500 with polymorphonuclears 63 per cent, lymphocytes 35 per cent, and eosinophils 2 per cent. Examination of the stool and urine showed nothing abnormal. Three blood cultures were sterile. Liver function tests revealed no deviation from normal. A Casoni test gave a positive delayed reaction locally and she also developed angio-neurotic edema.

X-ray films of the chest revealed a large mass in the lower two thirds of the right lung field which appeared to lie mainly in the region of the middle lobe in the lateral view. Fig. 7 B and C.

After admission she continued to run a swinging type of temperature from 100° to 104.5°. No cause for the fever other than the hydatid disease could be found and there was no response to penicillin or streptomycin. On the seventh hospital day laparotomy was performed by the general surgical service and a cyst in the left lobe of the liver was aspirated. A typical hydatid cyst was found and the membrane was removed by suction. Exploration showed the presence of a second hydatid cyst attached to the lower part of the right lobe of the liver. Removal of this was deferred. Postoperatively, the child did well and 17 days later a second abdominal operation was performed and the hydatid cyst in the right lobe of the liver was removed. Exploration at that time did not reveal any further cysts in the liver.

Because of the persistent enlargement however, a liver biopsy was to be performed on the 44th hospital day. A hypodermic needle was inserted to infiltrate with novocaïne.

FIGURE 7D

FIGURE 7E
At the depth of 1 cm. from the skin surface 2 cc. of clear colorless fluid were aspirated. This fluid showed a trace of albumin, but no scoleces. Within 12 hours after aspiration of this hydatid cyst the patient developed abdominal distension, generalized erythema, rapid respiratory rate and a temperature of 103°F. Benadryl was given and the symptoms gradually subsided within 48 hours. Forty-nine days after admission right thoracotomy was done and the large hydatid cyst in the middle lobe was removed by doing a right middle lobectomy. During this operation it was observed that the right diaphragm was markedly elevated and a mass was apparently present in the upper surface of the liver. The diaphragm was incised and a large hydatid cyst in the upper part of the right lobe of the liver was removed. She had a moderate febrile reaction for four days after operation, but subsequently was afebrile. She was discharged 22 days after operation in good condition. Fig. 7 E.

Discussion

Although the hydatid membrane is a permeable one, as evidenced by the fluid that forms within it, there has been no drug yet found which is innocuous to the host and yet will penetrate the membrane and kill the hydatid. Until such treatment becomes available, surgical treatment is advisable. The mortality in practically all series of cases is low, especially in the uncomplicated group, and therefore these lesions should be treated in the early stage before complications develop.

Our experience with attempted intact evacuation of the cyst has been small and not very successful, but the reports of Barrett and Thomas7 as well as Bendandi6 indicate that it is possible in many cases. This method of treatment does not eliminate the problem of the persistent empty sac, but with careful attention to obliterate the small bronchial fistulae that are apparent and by the use of sutures to oppose the pericyst surfaces, suppuration is not apt to follow, especially with antibiotic protection. If the cyst is small and can be removed by segmental lobectomy, this has been safer in our hands as far as avoiding rupture of the cyst is concerned. Every effort should be made to preserve pulmonary function, but if the hydatid is a large one and limited to only one lobe, we believe lobectomy is preferable to simple evacuation with a large empty sac remaining and a markedly atelectatic lobar remnant.

The hydatid that communicates with liver and lung transdiaphragmatically may tax the ingenuity of the surgeon and often are long difficult operative problems. The pulmonary part can usually be handled without too great difficulty, but the time necessary to obliterate the large multilocular hydatid hepatic abscess may be prolonged.

SUMMARY

A series of 20 pulmonary hydatids treated during the past three years without mortality are presented. Small uncomplicated cysts can be removed by evacuation or extrusion of the cyst or by limited pulmonary resection.

Those with both pulmonary and hepatic involvement but without transdiaphragmatic communications can be handled as for either one alone.

In three of our cases there were transdiaphragmatic communications between the liver and the lung and the pleura as well in two. Prolonged hospital treatment was necessary in each instance.
Les auteurs présentent vingt cas de kystes hydatiques pulmonaires qui ont été traités ces trois dernières années sans aucune mortalité. Certains kystes, petits et non compliqués peuvent être extirpés par la simple exérèse du kyste ou par une résection pulmonaire limitée.

En présence de ceux qui ont comporté à la fois une atteinte pulmonaire et une atteinte hépatique, sans qu'il y ait de communication transdiafragmatique, on peut agir comme s'il s'agissait de l'une des deux localisations isolées.

Dans trois de leurs cas, il existait des communications transdiafragmatiques, le foie, le poumon et la plèvre étaient intéressés. Il fut alors chaque fois nécessaire de traiter longuement les malades à l'hôpital.

RESUMEN
Una serie de 20 quistes hidatídicos tratados durante los pasados tres años sin mortalidad. Pequeños quistes no complicados pueden ser extraídos por evacuación, o extrusión del quiste o por limitada resección pulmonar.

Aquellos que tienen compromiso pulmonar o hepático pero sin comunicaciones transdiafragmáticas pueden ser tratados aisladamente cada uno.

En tres de nuestros casos había comunicación transdiafragmática, y en dos el hígado, el pulmón y la pleura se encontraban afectados.

Se necesitó en todos los casos una estancia prolongada en el hospital.

BIBLIOGRAPHY