HYDATID DISEASE of the LUNGS

by

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Hydatid Disease of the Lungs.

Hydatid cysts are the bladder-worm stage of *Echinococcus* a small tapeworm about 5 in. in length which inhabits the duodenum of the dog. It consists of a rostellum or head and three segments, the last of which alone is mature, and may exceed the rest of the worm in size. The terminal segment becomes detached, setting free the ova it contains, which may be ingested by man in contaminated drinking water, in dust, by thelick of a dog, or by using imperfectly cleaned dishes from which dogs have been allowed to feed.

The embryonal envelope is discharged off in the alimentary canal, and the small rice-shaped embryo goes its way through the intestinal wall, and enters the mesenteric veins and reaches the liver, in which in the great majority of cases it settles down to pass its cystic stage. In other instances the embryo travels from the liver probably by the blood stream to other organs and tissues of the body.

Structure and development of the Hydatid Cyst:-

1. An outer covering of fibrous tissue derived from the proliferation of the connective tissue of the organ in which the parasite is growing.

In some instances this capsule may be slight.
The ectocyst, the true cyst wall or hydract
membrane is composed of a stratified elastic
cuticle which in turn encloses within it the
more delicate endocyst or germinal layer.
The ectocyst is opaque, whitish in colour,
somewhat opaque, and bears some
resemblance to the white of egg in
appearance. It may be stripped off in
delicate layers, the laminae tending to
curl inwards.

Microscopically it shows fine concentric
lamination, each lamina exhibiting a
delicate cross-striction. Chemically the
material of which it is composed resembles
chitin in composition.

The endocyst - This consists of a cellular
germinal layer which may in turn be
differentiated into an outer layer of smaller
cells and an inner layer of larger somewhat
hexagonal cells. Muscular fibres and
calcareous bodies, are also described as occurring
in the endocyst. From the endocyst are
developed bud-like projections or broad
capsules which become hollow and within
each of which a varying number of corks
develops. Several generations of endogenous
cysts may be formed from the germinal layer,
the "mother cyst" coming to contain several
daughter cysts in the interior of which may
develop grand-daughter cysts, and even in a further generation of cysts before the generation of the broad-capsules in their interior. These endogenous cysts and the broad-capsules are filled with an albuminous, or clear lymph, watery fluid of low specific gravity usually 1040-1060 or a little more. The fluid contains almost as albuminous material, about half the total solid constitutes consist of sodium chloride, whilst traces of other salts as well as dextrose, galactose, leucine, tyrosine, succinic acid and some toxic substance of the nature of a leucomein are also found. The broad-capsules possess a structure somewhat similar to that of the parent cyst but with the layers reversed, so a thin cubicular layer internally and a cellular layer on the outer surface. Authorities differ as to the exact method of scolopophorin, some regarding them as endogenous buds, whilst Leuckart, who is supported by Struth and Sertor is of the opinion that they are formed as an externally activated club shaped process, perforated longitudinally by a canal—the continuation of the interior cavity of the broad-capsule. At the distal end of this protrusion the suckers and latches characteristic of the adult scolopin are developed. After further development the head becomes invaginated into the interior of the broad-capsule, just as
the fingers of a glove might be forced into the body of the glove and at the same time turned outside in. Ten, fifteen or twenty solenae may thus be forced within each blood-capsule of which there may be many thousands present within the larger cysts, the base of the young solenae by which it is attached to the interior of the blood-capsule becomes constricted, loses its lumen, and forms a delicate pedicle attaching the solenae which has now become a somewhat globular or slightly ovoid body in the interior of which are the hooklets and suckers. In this form it remains until it is ingested by the final host, in whose alimentary canal all parts except the solenae disappear. The solenae itself becomes evacuated, attaches itself to the mucous membrane of the intestines, and develops into the adult worm by the usual process of budding.

(General Pathology
Beattie Dickson)

Varieties of Cysts usually found in New Zealand.
1. In some cases there may be only a single large cyst without daughter cysts, the blood-capsule being attached on its inner surface. This is the type most commonly found in the lungs.
2. Endogenous cysts i.e. mother cysts producing daughter cysts and grand -
daughter cysts is by a process of endogenous or cyst lumen cyst formation.

This type is commonly found in the liver and in the lungs when secondary to a cyst in the liver.

The life of a cyst is unknown but it is probably many years and they may attain an enormous size. Occasionally the cyst dies when its contents become caseous and the wall becomes calcareous.

Hydatidiasis was made a notifiable disease under the Public Health Act in New Zealand in 1904 and during the year 1921 there were 37 cases reported with 2 deaths.

During 1931 there were 9 cases treated in the Christchurch Hospital. The lungs being affected in 8 cases. The great majority of cases come from the country districts as here shepherds and farm workers must

frequently drink from streams and watercourses contaminated by dogs. The dogs become infected by eating uncooked meat as the bitch is also an intermediate host for the echinococcus. Hydatid disease may occur primarily in the lungs or it may be secondary to cysts in its liver.

There may be more than one cyst in the lungs and they may be found in any lobe but are more usually found in the lower lobes and more frequently on the right side.

Cysts in the liver of the lung. Take to mistakes early.
Symptoms before rupture - A cyst may attain a very large size without causing any symptoms and when centrally situated in the lower lobes they are usually so large in experience of considerable size before they give rise to symptoms sufficiently severe as to compel the patient to seek advice.

The symptoms are not distinctive and have frequently been mistaken for those of early pulmonary tuberculosis but usually there is much less constitutional disturbance in this disease.

The first and commonest symptom is a cough which is usually dry and hacking but may later be accompanied by some mucoid expectoration.

Haemoptysis is of frequent occurrence but is usually small in quantity.

Rupture is common especially in cysts of large size, but pain is not usual unless the cyst has reached the surface of the lung where it may cause sudden.

Physical signs before rupture of the cyst depend upon its size and position in the lung. If the cyst is small and deeply seated nothing abnormal may be found, when it is of considerable size and near the surface but with compressed lung between it and the pleura the percussion note may be of a hollow character while the expansion of the affected
side is diminished, the breath sounds are faint and the heart and liver may be displaced. If the cyst is in contact with the chest wall the intercostal depressions may be obliterated; there is absolute dulness on percussion and vocal fremitus, local resonance and breath sounds are absent. There may be some crepitations in the lung tissue surrounding the cyst.

Complications - Pneumonia is common and may occur before or soon after rupture of the cyst. Dry pleurisy is common when the cyst reaches the surface of the lung and the condition may be marked by pleurisy with effusion.

Adhesions between the lung and chest wall are frequently found at operation and these are beneficial as they enable the surgeon to remove the cyst at one operation.

Diagnosis - It is very difficult to make a positive diagnosis of hydatid disease of the lungs on signs and symptoms alone. A cyst situated at the base of the lungs and invading the surface may be mistaken for pleurisy with effusion, but there is usually a rounded upper line of dulness with a cyst and there is no natural alteration in the dulness. When the cyst occupies the middle zone of the chest it may be mistaken for a localized empyema. The physical signs being the same viz. a localized area of dulness posterior in
shape, with absence of breath sounds, vocal fremitus, and vocal resonance, but should there be no history of an illness leading to pneumonia, these signs are strongly indicative of hydatid cyst. The history, absence of marked constitutional symptoms, and the locality from which the patient comes are of importance in establishing a diagnosis.

Examination of the blood may be of very great assistance as frequently hydatids causes a great increase in the eosinophile leukocytes which may constitute as high as 20% of the white cells. A negative count is of no value but an eosinophilia of over 5% in a suspected case almost certainly indicates hydatids.

Fraction of the complement - this test does not appear to be of any great value than the examination of the blood film as these cases which give a positive fraction usually also show a high eosinophilia.

X Ray examination is of the greatest possible value enabling a positive diagnosis to be made in the great majority of cases. The globular or void shadow is plainly seen either with the screen or on the plate, new growths in the lung however may sometimes be mistaken for cysts.

Course - In the majority of cases the cyst continues to grow and sometimes may attain an enormous size, almost filling one side of the thorax, but
Usually rupture takes place before it reaches such enormous dimensions. Rarely a cyst dies and undergoes degenerative changes.

**Prognosis & Treatment** - when treated by surgical measures the majority of cases recover completely. Medical treatment is useless and no drug is known which has any effect on the parasite. Infusion is exceedingly dangerous and must be very uncertain in its results. Surgical treatment is eminently successful if performed early and consists of the removal of one or two ribs, aspiration of the cyst and removal of the ectocyst, with drainage of the cavity in the lung. Should the lung not be adherent to the chest wall it is necessary to perform the operation in two steps viz. first stage - removal of rib and stitching of visceral pleura to chest wall. Second stage about ten days later. The cyst is aspirated, the lung re-expanded and the cyst wall is grasped with forceps and removed. A drainage tube is then inserted into the cavity in the lung.

Rupture of the cyst may be spontaneous or sometimes may be caused by a blow or by the insertion of an aspirator needle. The rupture may be quite insignificant and may pass almost unnoticed by the patient except for the increased amount of infection which has a peculiar salty taste, but sometimes it
may cause most alarming symptoms and
cases are recorded where it has caused death
by flooding the lungs with fluid, and there
is also a danger of suffocation by the block-
ing of the larynx with pieces of membrane or a
dilated cyst. Rupture into a bronchus is
the most common event, the contents and partly
the cyst wall itself when of moderate size
being expelled by coughing. The rupture may
take place in an outward direction when the
fluid is forced into the pleural cavity either
suddenly or simultaneously with the escape of
fluid into the bronchus, or in the latter case air
also would enter the pleural cavity causing
pneumothorax, while the presence of fluid alone
would give the signs of pleural effusion.
Rupture is usually ushered in by a violent
paroxysm of coughing followed immediately by
revere pain in the chest and urgent dyspnea,
and the expectation of a quantity of watery frothy
fluid and most forcibly by haeemoptysis.
The fluid expectorated frequently coagulates on
standing, but as there is nothing coagulable
in hydrated fluid the coagulation is probably due
to the presence of blood.

Exsanguineous paroxysms of coughing may succeed
one another at short intervals for hours until
the patient is quite enebrated and reeled with
fomi and has to be propped up on account of
the urgent dyspnea.
It is quite possible when the cyst is of moderate size for the leaflet, as well as the contents, to be expelled within a few hours, the pleura remaining being broken into fragments by the violence of the coughing, but in the majority of cases the collapsed cyst remains behind in the cavity in the lung.

Physical Signs Following Rupture - Signs of a cavity may be detected for some hours after rupture, or in one of my cases, the tympanic breathing was so marked that I was enabled to diagnose the condition before learning the history of the rupture. Later, probably within twenty-four hours there is dulness on percussion over an area of lung and absence of breath sounds, vocal fremitus and vocal resonance, these signs being due, I think, to the expansion of the compressed lung partially obliterating the cavity, and the lung tissue and diminished cavity being filled with exudate from the inflamed lung.

After the patient has recovered from the immediate effects of rupture, and if the cavity has not become cystic, there is usually an interval during which symptoms are absent, but usually within a few weeks the leaflet acting as a foreign body will cause irritation of the lung and the patient will develop a hacking cough and will commence
To expelinate pieces of hydatid membrane and
repeated haemorrhages which may be severe
and not uncommon. Patients invariably
complain of attacks of dyspnoea and
the peculiar and disagreeable
taste of hydatid membrane.
An attack of pneumonia affecting the lung
around the cavity is not uncommon, and
should the cavity be not completely empty
resolution is frequently delayed.
Suppuration may follow immediately upon
capture of the cyst or may be delayed.
When the cavity is situated in the open
the syrinx and symptoms may be mistaken
for those of advanced phthisis but should
hydrocele be found in the syrinx the
diagnosis is established.
The patient may have fever, dyspnoea,
night sweats, a persistent harassing cough
with purulent expectoration and sometimes foetid
expectoration. There is usually on percussion
with bronchial breathing and coarse crepitation.
When situated at the base of the lung the
condition may be mistaken for gangrene of
the lungs, the expectoration being profuse
and very foetid. The temperature is high and
of a hectic type and the cough, persistent and
disturbs his rest at night.
Prognosis & Treatment - When there is no suppuration the patient usually progress satisfactorily and eventually after some months expectorate the whole of the contents of the cavity. Most cases get well when left to nature and it seems, in my opinion, in uncomplicated cases to make an attempt to remove the abscess by surgical means.

When suppuration occurs and there is a large abscess in the lung or an empyema, surgical intervention is necessary.
Illustrative Cases.

Case 7. Large cyst in right lung.

A man 26 years of age, a policeman, was admitted to the Christchurch Hospital having been ill for one month.

History - A month before admission the patient had a pain low down on the right side of his chest, about the anterior axillary line. With this pain he had pyrexia and night sweats for the first ten days and about a week after the onset he noticed an irritative cough. On admission he had no pain but the cough continued.

Previous History - Pneumonia in infancy. Patient was unable to stand the training for the N.Z.T. He had pneumonia in 1916 and thinks that he has had recurrence since, in the same area in which he now feels the pain.

On admission - Temperature 98.4 Pulse 78

Respirations 18.

He is pallid but not anaemic. Cough slightly purulent.

On examination - Heart normal.

Lungs - anteriorly percussion note over the right lung is dull. Breaths come much diminished and break from his local resonant bronchus.

Posteriorly - Very resonant with few resonances.
at base. Left side - no abnormality in lungs.

Blood examination - complement fixation test - negative.

X-ray report - screen - nearly the whole of the right hemithorax is occupied by a homogeneous opacity. Upper margin is sharply defined. Right diaphragm could just be distinguished - immobile.

Film - Large egg-shaped homogeneous opacity with upper margin at level of first intercostal space. Lower margin merges with but can be clearly differentiated from the diaphragmatic shadow in the upper half. Right costophrenic space partially radiopaque - translucent. No cardiac displacement.

At operation a large cyst was removed. A month later, a sinus was draining from another site. X-ray examination was made and this showed an abscess cavity in the right lung fairly centrally placed, but slightly lower than the anterior border than the midline line lying on the level of the anterior portion of the 3rd or 4th rib. The cavity is half filled with fluid and on the screen examination this could be seen splashing about when the patient was moved. There is an addition an opacity at the right base obscuring the diaphragmatic shadow and obstructing the right costophrenic space. Other internal cavities
The drainage tube was re-erected and the abscess drained, and the patient was able to leave hospital in less than three weeks. It is remarkable that a cyst of this size should cause so little trouble and that the man was able to follow his occupation up to a few weeks before his admission to hospital.

Case 11

Puncture of cyst in left lower lobe.

Hemorrhagic cyst in upper lobe of left lung.

A young man aged 20 son of a sheep-farmer in the North Island of New Zealand was suspected of being tuberculous on account of several attacks of pleurisy and hemoptysis, when he consulted me he had recently recovered from an attack of pleurisy and complained of a dry persistent cough. The attacks of hemoptysis he stated always occurred on exertion.

Previous history: Two attacks of rheumatic fever several years previously.

On examination there was marked bulging of the praecordia with diffuse cardiac impulse and the open beat was in the 6th interspace in the anterior axillary line. On auscultation there was a loud systolic murmur of mitral incompetence.

Lungs: I could find no evidence of anything abnormal and did not suspect hydatid.
and both a consultant and I were of the opinion that the haemoptysis was probably due to his cardiac condition. A month later I received a telephone message from the country asking me to arrange for his admission to a nursing home as he was very ill with pneumonia.

I was informed later that he had gone to bed the night before in his usual health, and that he had been awakened an hour later with a violent attack of coughing and dyspnoea. For three hours the paroxysms of coughing were so violent and the intervals between them so short, appearing to be no more than a few seconds, and the struggle for breath so great, that his friends did not expect him to survive.

During this time he expectorated a good deal of yellowish, which petrified into a jelly-like mass. When I saw him in hospital he had marked dyspnoea, was slightly cyanosed and complained of an agonizing pain on the left side of his chest. He had paroxysms of coughing at intervals, but there was very little expectoration. His temperature was 103° and pulse rate 120.

On examination I found an area of denseness at the base of the left lung with faint breath sounds over the greater part of it, but between the anterior and posterior axillary lines about
the level of the ninth rib there was an area about the size of a crown where the breathing was amphoric in character. This breathing was so marked and so localized that I formed the opinion that it was a case of ruptured hydatid cyst and this was confirmed by the history of the attack.

The next day his condition had improved the dyspnea being less marked and the pain much easier while his temperature was 102. The physical signs had altered as the dulness was more marked and the breath sounds were absent over the whole area. While the dulness was marked it was not the absolute dulness of pleural effusion.

He improved rapidly and by the fifth day was almost normal except that there was a dull area at the left base with deficient breath sounds.

Blood examination - Eosinophils 19%.

When convalescent he was examined with the X Ray screen but could find no abnormality at the base of the left lung, but this was only to be expected as the cyst had been situated immediately behind his heart. In the upper lobe of the left lung we found that he had a small cyst about the size of an orange fairly close to the surface in the axillary region. This cyst was successfully removed by a two stage operation.
after his return to the North Island. He came to see me about 18 months later as he had had occasional attacks of pain low down in the left side of his chest and had expectorated pieces of hydatid membrane. I saw him again two years later when he was very well, was free from cough and had put on two stones in weight. There was no change in his cardiac condition.

Treatment, after rupture - When paroxysm has subsided and the greater part of the fluid has been evacuated give hypodermic injection of morphia to ease the pain and overcome the shock.
Case III. Large unruptured cyst, lower
lobe of right lung and ruptured cyst at apex of left lung.
A boy aged 10 son of a butcher was
admitted to Christchurch Hospital under
my care with a history of attacks of pneumonia
six months and two months previously.
Since the last attack he had had an
evening rise of temperature, a harsh
hacking cough with at times profuse
expectoration.
On examination it was found that the
heart was displaced 2 inches to the left and
the liver about 3 inches downwards.
On the right side in the scapular region
the percussion note was hyperresonant with
high pitched breathing and below this there
was dulness with diminished breath sounds.
Posteriorly and laterally there was absolute
dulness extending up to the angle of the
scapula and forwards as far as the anterior
axillary line, and the breath sounds were absent.
On the left side there was dulness in the
infra-clavicular and upper axillary region
with bronchial breathing and coarse crepitations.
X Ray examination showed a large opaque mass
occupying the lower half of the right hemi-
thorax the upper border being at the level of
the 5th rib in front.

Opinion examination : Mr. Lachlan Dalcro M.R.C.S.
Blood examination - two examinations were made, films being taken on successive days, the first on giving an Eosinophile count of 5.25% and the second of 10.7%.

The patient was transferred to my surgical colleague and a large cyst was removed from the right lung.

The boy progressed satisfactorily for five weeks but there was still dullness and absence of breath sounds at the right base and the sinus was still discharging. The heart and lungs returned to normal positions almost immediately after the operation. Another blood examination was made and showed an Eosinophile count of 25.5%, indicating the continued presence of hydatid infection.

He then had another sudden rise of temperature to 103° and had the appearance of a patient with pneumonia - flushed face, quick respirations, etc. The dullness at the left upper and middle lung regions still persisted and high-pitched bronchial breathing and coarse respirations. He had a high intermittent temperature for a week when he expectorated about two ounces of thick yellow froth. His temperature then became normal and remained there. Spatula examination showed no tubercle bacilli and no hydatid elements. Blood examination gave an Eosinophile count of 8.6%.
X Ray report - In screen examination of the chest, the left side appeared more opaque than the right, and there was a suggestion of a darker shadow at the left apex.

The patient then made satisfactory progress and was discharged a month later with good air entry into his right base and the bases closed, but there was tenderness and diminished breath sounds at the left apex.

A year later, the boy was re-admitted with a history of having had a high temperature for three days.

On admission, his temperature was 104°F and he had a harsh, dry, hacking cough, his temperature dropped to normal the next day and remained so.

On examination, heart apex beat diffuse but not displaced.

Right lung - Breath sounds normal.

Left lung - At apex and subclavicular regions, dullness with anthemic breathing.

Blood examination - Eosinophiles 5.3%.

X Ray examination showed nothing definite. He was discharged a few weeks later without much change in the physical signs.

Two years later, when I saw him, he looked well and had no more attacks and is now a strong, healthy lad.

When first admitted to hospital, he had...
The region of pneumonia with effusion at the right base and of advanced tuberculous at the left apex.

The persistence of the high eosinophile count is noteworthy in this case.

Case 15. Abscess of lung and empyema following immediately upon rupture.

A young man aged 21, a farm labourer of splendid physique was apparently in perfect health until after dinner on Christmas day when he had a violent attack of coughing and vomiting. Ten days later he was admitted to the Christchurch Hospital under my care as suspected gangrene of the lung.

On admission he had fever of a hectic type, with sweating and loss of appetite. He had a very troublesome cough, with profuse purulent and foetid expectoration, and his breath had a foetid odour.

On examination there was obliteration of the intercostal spaces and absolute dullness over nearly the whole of the right lung. Local tenderness, vocal resonance and breath sounds were absent, and叩诊音 was deficient.

From the history this was clearly a case of ruptured hydatid cyst followed by abscess if
the lung and empyema.
He was transferred to my surgical
colleague who at the operation evacuated
a large quantity of foul-smelling fluid,
together with the cyst wall.
He made a good recovery and for several
years had slight attacks of haemoptysis
on exertion which ceased him to be
rejected for service with the New Zealand
Expeditionary Force. He is now perfectly well
and has had no haemoptysis for about
two years.

Case V. Hydatid cyst in liver followed by
cyst in right lung. Rupture and
infection of hydatid membrane.

A woman aged 25, the wife of a farmer,
consults me on account of a swelling in
the right hypochondriac region which I
diagnosed as hydatid cyst of the liver. She
underwent an operation and three cysts
were found in the liver and removed.
Five years later she came to see me on
account of having on several occasions, for
about six months, had attacks of coughing
when she brought up fluid varying in colour
from yellow to red and containing at times
fragments of white membrane and small
cysts. One of these cysts about the size of
a pea she brought to show me and to make the diagnosis obvious.

Symptoms: She had attacks of pain under the right breast radiating through to the right scapula and several attacks of nocturnal dyspnæa. She was well nourished and had lost weight and pulse and temperature were normal.

On examination: Right side of chest anteriorly increase in liver dulness upwards above the level of right nipple. The breath sounds were fainter over dull area and some rales were audible. No dulness posteriorly and no definite physical signs.

Blood examination: Erythrocyte count 3.7.

Complement fixation test: negative.

X Ray examination revealed no evidence of a cyst or any abnormality.

She had apparently experienced the whole of the cyst and its contents, as she told me when I saw her a few months ago than she had seen no signs of any membrane for more than a year.
2. Abscess cavity in lung (case 7), four weeks after operation.
3. Same case with drainage tube in situ.
5. Very large cyst in right lung. Patient died four weeks after operation.
6. Multiple cysts in lung. Patient caused into several small areas andecal chest has been no operation.