mation of the connective-tissue corpuscles—Wagner*) the proper hepatic cells disappear. The new vessels developed from the branches of the hepatic artery have very delicate walls, and are liable to rupture, infiltrating the cancer-masses with hæmorrhagic extravasation. When the periphery of the organ is reached by the new formation, hæmorrhage may take place into the peritoneum, and sudden death ensue from this cause. The branches of the portal vein are compressed, or they may be filled with cancer-cells. The lymph vessels and glands may also become filled and infiltrated. The bile-ducts are compressed and disappear, except the larger ducts, which become dilated into pouches with retained bile, or pass unchanged through the cancer-masses. The growth of cancer is not continuous and uniform, but paroxysmal, as it were—now rapid, now slower; and when the formations have existed for some time they undergo a fatty metamorphosis. It is this change in the interior of the nodules which leads ultimately to the umbilications already mentioned. The hepatic parenchyma not invaded by the cancerous new formation remains unchanged, or is more or less hyperæmic, or undergoes atrophy. The size of the whole organ is usually increased, and sometimes it attains extraordinary dimensions, weighing ten, fifteen, or twenty pounds (Frerichs). Cancer of the liver is rarely primary, but is secondary to a deposit elsewhere, most frequently in the stomach. Of ninety-one cases collected by Frerichs, forty-six were secondary to cancer in organs having a vascular communication with the liver, and cancer was primary to the liver in scarcely one fourth of the cases. The author has met with one case of primary cancer of the gall-bladder, the morbid process *apparently* beginning in the exudation of a local peritonitis caused by the passage of hepatic calculi.

Symptoms.—Cases of cancer of the liver are occasionally encountered in which no characteristic symptoms existed; the patient has ill-defined uneasiness in the right hypochondrium, disorders of digestion, and low spirits; he emaciates progressively, is cachectic, and ultimately dies. Again, cancer of the liver has a clinical history which is merely the conclusion of a series of symptoms referable to cancer in another organ, notably the stomach. The defined symptoms of hepatic cancer are apt to be obscured by some leading condition associated with it, as ascites. Those attacked with cancer are advanced in life as a rule. Before any symptoms of disturbance in the hepatic functions manifest themselves, there are present disorders of digestion, flatulence, and constipation. Then feelings of uneasiness, of weight, of tension, and of pain in the right hypochondrium are experienced. On palpation, soreness is developed by pressure, and the liver is felt

* "General Pathology." Translated by Drs. Van Duyn and Seguin. New York, 1876, p. 503.

stretching beyond the margin of the ribs; it is indurated, irregular in outline, and nodulated. In the further progress of the case, the liver extends downward still more, and nodules can be easily made out; the area of hepatic dullness is increased in all directions, but chiefly downward, and there may be a good deal of spontaneous pain and exquisite tenderness on pressure by reason of a local peritonitis.

Jaundice is not present in the majority of cases, and exists only when the lymphatic glands in the fissure or the cancer nodules are enlarged sufficiently to compress the hepatic or common duct. Ascites is present in about one half of the cases, and is produced more frequently by peritonitis than by compression of the portal, but this vessel is obstructed occasionally by cancer thromboses. The ascites may be so considerable as to produce great distress by embarrassment to respiration and by interference with the circulation. The ascites may be in part due to the watery condition of the blood. The fluid is a pale, straw-colored serum, or it contains flocculi of lymph and is turbid, or it is mixed with blood, the source of which has been heretofore alluded to. Gastro-intestinal catarrh is set up by the congestion of the portal system; hæmorrhoids form; hæmorrhages occur from the intestinal mucous membrane, and an obstinate watery diarrhœa succeeds to the constipation which was an early symptom. All of these causes combine to produce a cachectic state. The complexion gradually assumes the characteristic earthy or fawn color, emaciation is extreme, the feebleness is excessive, the hands and feet are cold, the skin is dry and harsh, and the expression is dejected and worn.

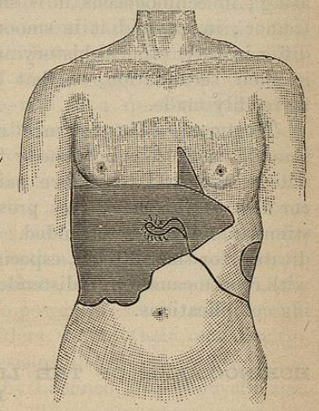

Fig. 14.—Area of Dullness in Cancer of the Liver.

Course, Duration, and Termination.—The course of cancer of the liver and its duration are much influenced by its form—the medullary proceeding to a fatal termination more rapidly than scirrhus. As already stated, the progress is not uniform, the growth at times being suspended and then again quickening into renewed activity. Cases terminating in eight weeks have been reported, and others continue with varying fortunes for months and years. There is but one mode of termination, that in death.

Diagnosis.—It may not be possible to diagnosticate cancer in those cases without any local symptoms, or in the incipiency of any case. When, however, the enlarged and nodulated liver can be

felt, the difficulty of diagnosis is much less, especially if the patient is of advanced age, and the cachexia, the ascites, etc., are also present. Distinction is to be made between cancer, abscess, echinococcus, and amyloid disease; in all these the liver is enlarged (as a rule) and projects downward, but, in cancer, the organ is nodulated and indurated; in abscess it is smooth and softer, and may be fluctuating; in echinococcus it is smooth, elastic, and having the purring tremor; in amyloid it is smooth and uniform, but indurated. They differ in their clinical history and in their cause, in their duration and in their termination, so that a diagnosis can, in well-marked cases, be readily made.

Treatment.—The treatment must necessarily be palliative and symptomatic, as there is no remedy for cancer in any situation. Anodynes will be required to relieve pain. Careful regulation of the diet, according to the conditions present, and the timely administration of stimulants will be demanded. Ascites will require the treatment indicated for that disease, especially the tapping—for the interference with repose caused by a distended abdomen is one of the most distressing complications.

ECHINOCOCCUS OF THE LIVER (HYDATID DISEASE OF THE LIVER).

Definition.—By the terms echinococcus of the liver, hydatid disease, cystic degeneration, multilocular cyst, etc., is meant the penetration into the liver of the scolex of the sexually immature tænia echinococcus. The embryos, gaining access to the intestines of man, migrate, and, doubtless chiefly by the portal vein and bile-ducts, reach the liver in which the cyst or cysts develop, sometimes attaining immense size.

Causes.—As the echinococcus is the tænia of the dog, only those who live in a humble way, with their animals about them, suffer from these migratory parasites. As the ova are discharged with the excrement of the dog, it is obvious that they can gain admission to the human stomach only through the most filthy practices, or by carelessness in the obtaining and storing of drinking-water and food. In Iceland, more than in any other part of the world, do the people suffer from cystic disease—as large a proportion as one sixth of the population being infected. This preponderance of the disease is due to the number of dogs and to the promiscuous way in which the members of a family and their dogs live together in their wretched hovels. The disease occurs at the middle period of life chiefly, and rarely in the young. In the only case of echinococcus of the liver met with by the author, the patient, a male, was forty-two years of age.

Pathological Anatomy.—When the echinococcus (or two or more) lodges in the liver it is presently enveloped in a tough, fibrous, yellowish-white membrane, constructed out of the adjacent connective tissue, and closely adherent. Within this adventitious membrane is contained the embryo, inclosed in a clear, translucent sac made up of numerous concentric layers. This sac of the embryo is the mother-sac, and in the interior of it a number of so-called daughter-vesicles, and still other, granddaughter-vesicles, are developed, and ultimately the mother-sac, with its investing membrane, attains to extraordinary dimensions. The daughter-vesicles vary in number from a few up to many thousands, and in size from that of a pea to that of a goose-egg. The fluid of the sac is clear, opalescent, weakly alkaline, and of a specific gravity of 1·008 to 1·013; it contains no traces of albumen, but a large proportion of sodium chloride and some crystals of cholesterine and hæmatoidine.* The inner membrane of the daughter-vesicles is lined with a germinating layer, from which the embryos spring; and scolices, attached as well as free, can be observed within the sacs. These scolices are the immature tæniæ, and can be recognized with a low power—sixty diameters—as possessed of a head, four suckers, and a row of hooklets. When detached, these scolices have the power of active motion, and can withdraw their probosces and hooklets within their own cavity. There are hydatids without daughter-vesicles, and others entirely without a scolex, which were denominated by Laennec acephalocysts, and by Küchenmeister,† sterile echinococci. There are great variations in the size, number, and position of the cysts. They are found in all the lobes, but most frequently in the right, buried in the substance or projecting from the surface of the organ. Usually but one cyst exists, but there may be several—as many as five or six. It follows that the size, shape, and appearance of the liver will vary with the number, position, and growth of the cysts. It may attain a sufficient size to distend the abdominal cavity, or at least make a great protrusion in the right side. With the growth of the cyst, the hepatic tissue is correspondingly atrophied, by being encroached upon, while the rest of the organ remains intact, or undergoes hypertrophy, or is hyperæmic. As a rule, the cysts do not obstruct the large blood-vessels and bile-ducts; hence the infrequency of ascites and jaundice; yet both may be encroached upon—even obliterated. It sometimes happens that communication is established between bile-ducts and the cyst, by the breaking through of the duct in the course of development of the cyst, and, bile entering, the growth of the echinococcus is arrested. The cysts sometimes penetrate the common duct, also the gall-bladder, and rarely the portal vein. They may be discharged through the ducts and a cure be thus effected, but, if they

* Davaine, "Traité des Entozoaires." Paris, 1872, p. 379.

† "Animal and Vegetable Parasites," *op. cit.*

enter the veins, thrombi form, with the usual disastrous results. Echinococci-cysts may undergo calcification. The adventitious envelope becomes thicker and tougher, and calcareous salts are deposited; expansion and growth are prevented; the parasites die, and are found flattened and contracted. In other cases there is developed in the interior of the capsules a dense, honey-like or puriform fluid, which had previously been clear and then milky, and remains of the scolices, especially the hooklets, are found floating in, or mixed with, the contained fluid. Crystals of hæmatoidine and bile also are found mixed with the contents of wasting cysts.

FIG. 15. Isolated Scolex of the *Tænia echinococcus*, from the Pig.

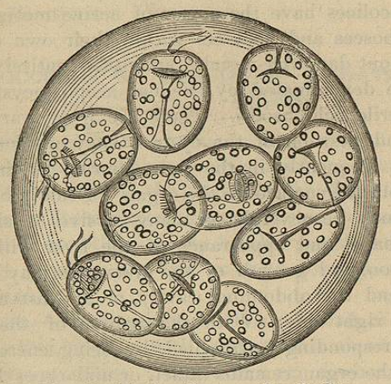

FIG. 16.—*Tænia echinococcus*, from the Pig.

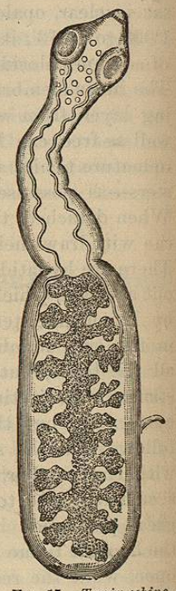

FIG. 17.—*Tænia echinococcus*, from the Dog.

A great many cysts are destroyed and cease to grow, as has been described, but many continue to enlarge, pushing up the diaphragm and displacing the heart, and reaching sometimes as high as the second rib (Frerichs). Others, growing downward from the under surface of the liver, push aside the stomach, and force the abdominal organs into the pelvis, or, but rarely, compress the ascending vena cava, causing œdema, varicose veins, etc. A cyst may rupture into the cavity of the chest—into the pleural or pericardial sac, causing fatal inflammation, or excavate a cavity in the right lung, and shreds and parts of the vesicles be discharged through the bronchi by expectoration. A cyst

may also rupture into the peritoneum, producing fatal peritonitis, or into the intestines, and be slowly discharged by stool. Rupture within the abdomen is usually due to a blow or other injury, but is sometimes spontaneous. The *echinococcus multiloculari*s, which was formerly mistaken for colloid cancer, but has since been accurately described by Virchow, differs from the ordinary form, in that it is a very firm, hard tumor, consisting of dense fibrous tissue, containing cavities filled with a gelatinous material. On account of its tendency to ulcerative degeneration, Virchow called it the "ulcerative multilocular echinococcus-tumor." Friedreich* holds that the development of this form takes place in the gall-ducts and blood-vessels.

Symptoms.—A cystic tumor of small size, deeply placed, and not so situated as to interfere with other parts, may not cause any symptoms, and therefore remain undetected. But a cyst of considerable size, projecting from the liver, or which has increased the size of the organ, and especially if it has encroached upon neighboring parts, will cause sufficient disturbance of function to lead to its early recognition. If a cystic tumor increases to any considerable extent the volume of the liver, there will be a feeling of weight, heaviness, and dragging in the right hypochondrium, and some disorders of digestion; if it happen to be near the hilus of the organ, the portal vein and the common or the hepatic duct may be pressed upon, causing ascites and jaundice; if near or at the upper convex surface of the right lobe, the diaphragm will be pushed up, and a dry cough and dyspnœa will be the result. The degree of enlargement is necessarily various. The tumor may fill in the whole space from the inferior border of the second rib to the pelvis, displacing the thoracic and abdominal organs, and forcing out the intercostal spaces. The tumor may take various forms: the liver may be uniformly enlarged; there may be a growth projecting from the borders of the organ, and having a globular or hemispherical form similar to that of the gall-bladder; or, one lobe may be the seat of the growth, the other remaining intact.

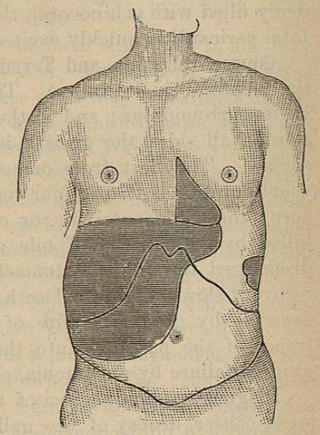

FIG. 18.—Liver enlarged by Hydatid Cysts.

On palpation, an hydatid tumor is elastic, resisting but soft, fluctuating, and, in somewhat more than half the cases, presenting the pecu-

* Virchow's "Archiv," vol. xxxiii, p. 16, "Ueber multilokulären Leber-echinokokkus."

liar fluctuation known as "purring tremor," or "hydatid purring"—a sensation appreciated by the sense of touch as the trembling of a bowl of jelly appears to the eye. The tumors are not painful, and it is exceptional for any tenderness to be felt on pressure. Jaundice or ascites occurs only in the rather rare event of a tumor near the hilus, or so situated as to compress the vein and duct. Dyspnœa and cough occur when the cyst develops into the thorax; irregular action of the heart, when this organ is pushed from its position; constipation and vomiting, when the intestines and stomach are encroached upon; swollen and œdematous feet and ankles and enlarged veins, when the cava is compressed. All of these symptoms arise, when the form and direction of the cyst develop them, without any constitutional disturbance, and if such disturbance occur it is due merely to the interference of the growth with important functions. If the echinococcus burst, new symptoms arise. If the stomach is entered, there will be some local pain, and the parasites will be rejected by vomiting, often in immense numbers; if the intestine is perforated, the parasites are discharged by stool, and recovery may ensue in either case. If the vena cava is entered, sudden death with the symptoms of asphyxia takes place. If the pleural cavity receive the echinococci, pleuritis is excited, and the cysts, with the products of inflammation, may be subsequently discharged through the lung by a bronchus. If the pericardium is suddenly filled with echinococci, the action of the heart is disturbed, and fatal pericarditis quickly excited.

Course, Duration, and Termination.—The hydatid disease is essentially chronic in its course. The development of the cyst is affected by its surroundings; and in the interior of organs, subjected to pressure on all sides, the growth is slower than if it is deposited on the surface. They last from one or two years up to thirty, but the most usual duration is two to four years. They may undergo a spontaneous cure: the echinococci die, or on the opening of bile-ducts they are killed by the entrance of bile, and subsequently shrivel up; they are discharged through the stomach and intestine, or by the bronchi, and recovery slowly ensues. Death is not unfrequently produced by echinococci—by gradual failure of the powers of life; suddenly, by entrance of the parasites into the vena cava or the pericardium; and gradual failure by pneumonia, or suppuration, or pyæmia.

Diagnosis.—Echinococci of the liver may be confounded with abscess, cancer, dropsy of the gall-bladder, aneurism, and hydrothorax. It differs from abscess, cancer, and hydrothorax by the absence of pain and constitutional disturbance; from abscess, by the character of the fluctuation; and from cancer, by absence of the hard, non-fluctuating nodules of the latter. From dropsy of the gall-bladder it is distinguished by the lack of a history of attacks of hepatic colic, their cessation and the enlargement of the gall-bladder coming on slowly; but

the distinction is most certainly made by the use of the aspirator, since it has been shown that this organ may easily and with perfect safety be penetrated by the needle. From aneurism, echinococci are readily differentiated by the existence of a heaving, expansile pulsation in the former, without the peculiar fluctuation of the latter. There is more real difficulty in separating hydatids pushing up the diaphragm, from effusions into the pleural cavity, as the physical signs are the same. An attentive consideration of the previous history will aid materially in arriving at conclusions. The growth of echinococcus is slow and painless, and the development of the local symptoms is free from that disturbance which precedes the occurrence of an effusion in the chest. But, above all other means for coming to a correct conclusion, must be placed the use of the aspirator and the microscopic examination of the fluid.

Prognosis.—When the echinococcus is large, and its particular direction unknown, the prognosis is grave. The early use of the aspirator enters largely into the question of prognosis, for early puncture will insure the death of the parasite. When discharge takes place by the stomach and intestine, the prognosis will be favorable; and recovery may also be expected in those cases discharging by the bronchi, provided the right lung is only so far damaged as to permit the passage of the cysts. When there is a large suppurating cavity in the right lung the prognosis is unfavorable.

Treatment.—There is no medicinal treatment which can in any way affect the origin or growth of the echinococci. Fortunately, we possess simple surgical measures by which these cysts may be safely and certainly closed. These are, puncture by an aspirator needle and withdrawal of some of the fluid, and electrolysis. Whenever a cyst can be reached by the needle, it can be subjected to either of these expedients. The simple puncture and withdrawal of some of the fluid contained in the mother-vesicle should be tried first, as this has succeeded in numerous instances. This failing, the method by electrolysis should be practiced. Dr. Hilton Fagge and Mr. Durham * report eight cases in which electrolytic decomposition was employed with entire success. Two needles connected with the negative pole were inserted into the sac, and the positive pole, in the form of a large sponge-electrode, was applied on the integument in the neighborhood. Ten cells were used to furnish the current, and the needles were permitted to remain ten minutes. As, in the process of electrolytic decomposition, hydrogen and the alkalies (potassa, soda) appear at the negative pole, it is obvious that the parasites must be killed by the electrolytic action. Besides these measures, iodine has been injected into the mother-sac with success.

* "Medico-Chirurgical Transactions," vol. cliv, "On the Electrolytic Treatment of Hydatid Tumors of the Liver, with an Addendum on Simple Acupuncture."

ANEURISM OF THE HEPATIC ARTERY.—The author can add one to the few examples of aneurism of the hepatic artery. The size of the tumor in the reported cases has varied, but the tumor can not always be felt, or rupture takes place before it has attained sufficient dimensions to be felt through the abdominal parietes. In one instance the liver was displaced by it. Usually, long before the existence of a tumor can be made out, severe pains are experienced in the right hypochondrium. The attacks of pain are at first paroxysmal, and can hardly be distinguished from hepatic colic, but in the further progress of the case there are constant pain and soreness in the right hypochondrium, and paroxysms of severe pain. The pressure of the aneurism on the hepatic plexus is the cause of the early appearance, severity, and persistence of the pain. Jaundice is usually present, due to pressure on the hepatic or common duct, and, in the case referred to by the author, ascites was the prominent symptom. The interference with the hepatic functions, the constant suffering, etc., cause rapid failure of the vital powers; the flesh wastes, the skin appears earthy or jaundiced, the digestive functions are disordered in consequence of the absence of bile, and ascites may slowly accumulate. Death takes place by rupture and escape of the blood into the peritoneal cavity. In one case (Frerichs) blood was regurgitated by the stomach, and it reached this organ by a circuitous channel; communication by a very small orifice was established between the sac of the aneurism and the gall-bladder, and a small quantity of blood continually passed from the gall-bladder to the duodenum, and thence by retching into the stomach.

THROMBOSIS OF THE PORTAL VEIN is a result of various obstructive conditions, as cirrhosis, chronic atrophy, cancer, and tumors. The symptoms due to the thrombosis are those of obstruction to the portal circulation, and occur rather abruptly in the course of the chronic malady associated with it. The pressure in the initial radicles of the portal vein is suddenly increased, and free transudation of blood occurs along the intestinal mucous membrane, hæmorrhoids form, and a watery diarrhœa takes place. The spleen enlarges, and ascites develops with great rapidity. Efforts toward a compensatory circulation are made by the communicating veins, which suddenly appear enlarged on the surface of the abdomen. The urine becomes scanty and of high specific gravity. The patient presents a very decided cachexia, the strength rapidly fails, and death occurs in a few days or weeks. The obstruction by the thrombus is not always complete, so that an imperfect circulation is maintained. In that case the symptoms will be less formidable and the progress less rapid. The only remedy which offers any prospect of relief is ammonia, which has the power to dissolve coagula. Unfortunately, the stasis

in the portal system so hinders absorption that remedies do not readily enter the blood. As Halfourd, of Australia, has demonstrated the innocuousness of the intravenous injection of ammonia, this expedient should be practiced in such cases. It consists in the injection of one part of aqua ammoniæ to two parts of water into any convenient vein. If, however, there be any movement of blood in the portal, the ammonia should be administered in the form of the carbonate — five grains every three hours. The usual remedies for ascites will be necessary.

SUPPURATIVE INFLAMMATION OF THE PORTAL VEIN, or SUPPURATIVE PYLEPHLEBITIS.—This is always a secondary disease, and has its origin in suppuration occurring at some point in the distribution of the portal vein. An inflammation occurs in the tunics of the vessel, which become soft and discolored by the presence of a fluid and fibrinous, purulent exudation, and by imbibition of the hæmatine. The intima especially is discolored, brownish, yellowish, or greenish-yellow, and is covered with layers of fibrin and pus. The changes extend to and involve the adventitia. A thrombus forms in the vessel and undergoes characteristic alterations, softens in the center, becomes yellow, the fibrin breaking up into a granular mass, and the hæmoglobulin disintegrating and gradually forming, with the rest of the thrombus, a purulent-looking fluid. Thrombi form most frequently in the hepatic branches of the portal, and emboli in some cases are deposited in other parts of the liver, and secondary pyæmic abscesses occur in various parts of the body.

Suppurative inflammation of the portal vein is associated with and is dependent upon ulcerations in various parts of the intestinal mucous membrane, or suppuration and abscesses in the mesenteric glands, or the inflammation and ulceration following impaction by gall-stones, etc. The symptoms, therefore, succeed to those of the malady which caused it. The initial symptom is pain, and it is felt in the umbilical region, in the iliac region, or in the hypochondrium, according to the branch of the portal implicated; then follows a severe rigor, which, after a period of high temperature, terminates in a profuse sweat. These paroxysms, intermittent in type, are repeated, not in a regular order, but at uncertain intervals. In the interval the temperature is rather subnormal; during the pyrexia the temperature rises to 105° or 106° Fahr., and the sweats are most exhausting. The liver enlarges and is tender, and jaundice appears. The spleen also enlarges, doubtless because of the obstruction in the portal circulation. Usually there is a profuse diarrhœa, the discharges consisting of a reddish, watery, and fetid fluid, sometimes of bilious matter. The abdomen becomes tender, and is much distended; vomiting comes on; the exhausting alvine discharges continue, and hence the powers of life rapidly decline.