

ward corresponding to the cyst. The respiratory motility of the borders is unimpaired unless there is or has been a complicating pleuritis, something which is not uncommon.

Functional disturbances resulting from pressure upon the various abdominal and thoracic organs vary with the organs affected and with the degree of the pressure. These symptoms are often far more marked than those from the liver itself.

Compression of the portal vein or the inferior vena cava may cause ascites and other circulatory disturbances, which may entirely obscure the presence of the cyst. Icterus may result from compression of the common duct.

Constitutional disturbances from these cysts are practically wanting, except as the results of pressure upon neighboring structures, or of secondary infection of the cyst with pyogenic organisms and the conversion of the cyst into an abscess.

From this brief outline it is evident that the clinical picture of the echinococcus cyst varies greatly, and the diagnosis is often difficult. The main elements in the diagnosis are the demonstration of a circumscribed enlargement of the liver, unaccompanied usually by marked constitutional disturbances, and yielding to exploratory puncture a fluid which may vary in character, but which contains elements which are absolutely peculiar, namely, the echinococcus hooklets and scolices. These are so peculiar that they will be immediately recognized by any one who has ever seen the pictures found in all text-books upon diagnosis.

When small the cyst must be differentiated from other processes which cause localized enlargements, particularly the abscess and cancer. Both these are accompanied by marked constitutional disturbances, which in the case of a cyst are conspicuously absent.

Pain is usually present with abscess or with cancer, while it is usually absent with cyst. The history of a residence in certain parts of the world, notably Iceland, or of constant association with dogs, is a point in favor of the cyst.

Exploratory puncture will remove all doubt, but here, as with the abscess, this is not entirely free from danger.

A very sharply localized cyst might, by enlarging downward, simulate a distended gall bladder, but could not assume the peculiar pear shape of the gall bladder, nor would it present the motility of the gall bladder. The history of the patient would moreover be different.

When the cyst is larger and grows downward it needs differentiation from cysts of other organs, such as the pancreas, ovaries, or kidneys. Usually the differentiation is easy from the history and from the shape and location of the tumor. In the exceptional cases, close attention should be given to the relation of the colon to the tumor. This is pushed down and usually back by cysts of the liver, forward by cysts of the kidney, upward by cysts of the pancreas and ovaries.

When the cyst enlarges upward, it may require differentiation from a pleuritis exudativa. Ordinarily the history of an acute onset with pain, fever, and the peculiar shape of the dulness will speak for a pleuritis. In cases of pleurisy with insidious onset, when the exudate is large and unaccompanied by manifest constitutional symptoms, especial attention should be paid to pressure effects on the heart. With pleurisy the heart is displaced outward, with cysts the displacement is more often upward and outward. In cases which are doubtful the exploratory puncture will decide.

The true nature of the cyst is often learned from its rupture into some neighboring organ, such as the stomach, colon, lungs, when the hooklets, scolices, and daughter cysts may appear in vomitus, feces, or sputum.

The multilocular echinococcus is even less common than the cystic form, except in certain parts of Europe, where it is not infrequent. The onset is insidious and usually without symptoms until the disease has made great progress; then weight and pain in the epigastrium and right hypochondrium appear, with gastro-intestinal disturbances. Icterus and ascites are common and often

appear early. The liver is often greatly enlarged, hard, with irregularly distributed tumor masses, so that the surface is grossly lobulated. The border is often irregular and very hard. The liver usually shows its normal respiratory motility. The spleen is often enlarged.

The condition must be differentiated from multiple carcinomata of the liver, which differ in their more rapid course, marked cachexia, blood changes, and age of the patient, and show also the symptoms caused by the primary cancer. In most parts of the world, cancer of the liver is of almost daily occurrence, while the multilocular echinococcus cyst is extremely rare. In cases which cannot be differentiated in this way, make an exploratory puncture.

Hypertrophic cirrhosis and syphilis of the liver may be simulated. Both these conditions are relatively common. With the cirrhosis, the jaundice is usually not so intense and it varies from time to time, the splenic tumor is more common, an ascites is rare, and the enlargement of the liver is more uniform. With syphilis of the liver the individual enlargements in the liver are not so large or hard, and the liver is more irregular; jaundice, ascites and splenic tumor are less common. Here also exploratory puncture may be necessary.

There are a number of other pathological processes which cause localized enlargements of the liver, such as sarcoma, fibroma, adenoma, and cysts, but they are so exceptional that their consideration may be omitted from an article of this sort.

Corset Liver.—Tight lacing, either by means of a corset or by a string about the waist, often causes a deformity of the liver, which in extreme cases may cause a condition simulating a tumor. This may be due to an elongation of the liver because of the pressure to which it has been subjected, and its true nature is then easily recognized. Sometimes, and this is more often when the constriction of the waist has been made with a string instead of a corset, the right lobe, rarely the left, is elongated and the part directly below the pressure is atrophied so that a larger or smaller mass of liver tissue is separated from the liver and connected to it by a band of fibrous tissue. The shape, size, and motility of such a mass vary in the different cases. It must often be differentiated from movable right kidney. It differs in shape from the kidney, lies nearer the front wall of the abdomen, and lies in front of the colon instead of behind it. Attention to the shape of the thorax and to the history of lacing is also of assistance.

Movable Liver.—This forms a tumor on the right side, one which may extend downward to the pelvis or far over to the left of the median line. At the same time the liver tilts so that the convex surface lies forward. The form of the liver is unchanged. This, together with the absence of liver dulness in the normal site and the fact that in most cases the liver can be returned to the normal site when the patient is in the dorsal decubitus, makes the diagnosis easy.

TUMORS OF THE GALL BLADDER.

With occasional exceptions these are merely distentions of the gall bladder with bile, mucus, or pus, either alone or in combination with stones. The degree of distention varies from just sufficient to admit of palpation of the gall bladder, as a small rounded projection below the edge of the liver in the parasternal line, to a sac capable of holding a litre or more. The larger the bladder the more it assumes a long, pear-shaped form—extending downward from the liver just beneath the abdominal wall. With increasing size, the motility increases until the bladder can be moved freely from side to side and backward, but it always tends to return to its position just beneath the abdominal wall. It also shows distinct respiratory motility. The tumor feels smooth, elastic, and sometimes fluctuation can be made out. Rarely the friction of stones moving over one another can be felt.

Usually palpation alone shows the presence of the tumor, but in favorable cases, when the abdominal walls

are thin, its presence, shape, form, and respiratory motility are visible. Percussion also may show its presence.

An enlarged gall bladder practically always lies in front of the colon and intestines, and to the right and partially in front of the stomach. Inflation of the colon and stomach is sometimes necessary in making the diagnosis.

Usually the anatomical location of the tumor, its shape, motility, and manifest relation to the liver facilitate the recognition of the tumor as one from the gall bladder, but when the distention is extreme it may be confused with a hydronephrosis or a cystic ovary. Attention to any history of disturbances of the urinary or genital tract and the demonstration of the relation of the tumor to the colon—which lies behind a distended gall bladder, in front of a hydronephrosis, and above a cystic ovary—will remove all doubt. In addition to these points the gall bladder is attached above to the liver and is free below, while an ovarian cyst is attached below and remains free above. The hydronephrosis arises manifestly from behind.

The diagnosis of the cause of the dilatation of the gall bladder and the finding of the site of the obstruction may be a simple or a difficult matter. Repeated attacks of biliary colic would suggest a stone; acute gastro-intestinal symptoms with jaundice would suggest an acute catarrh of the ductus choledochus; and progressive cachexia with gastro-intestinal symptoms would suggest a carcinoma of some of the organs near the porta.

The diagnosis of the nature of the fluid in the cystic bladder (pus, bile, or mucus) is, like the diagnosis of the cause, easy or hard. If accompanied by jaundice, it is probably bile, and the obstruction is in the common duct. If there is no jaundice, the fluid is probably mucus, but may be bile or pus, and the site of the obstruction is at the neck of the bladder or in the cystic duct. An empyema of the gall bladder is accompanied by the ordinary constitutional disturbances of suppuration, but the presence of such symptoms, when the gall bladder is distended, does not in itself prove that the fluid is pus.

Exploratory puncture of the gall bladder is ordinarily too dangerous to be justifiable.

Cancer of the Gall Bladder.—This is on the whole a rare disease, and the diagnosis is based upon the demonstration of a hard, nodular, slowly growing tumor in the region of the gall bladder, accompanied by cachexia and anæmia. The diagnosis is strengthened by a history of biliary colic, and by the exclusion of carcinoma of any of the organs frequently causing metastases in the liver.

TUMORS OF THE STOMACH.

The methods employed in the examination of the abdominal tumors so far considered have been almost entirely physical, aided sometimes by microscopical examination of the blood. With cases of tumors of possible gastric origin, chemical methods of examination become prominent; but unfortunately, in spite of the immense amount of study and work which has been put upon them, their results are often uncertain and contradictory, so that they no longer receive the respect formerly paid them.

The pathological processes which can cause a tumor of the stomach are very numerous, but most of them are so uncommon that they need no mention in an article of this sort. The processes which demand our attention are the cancer, the ulcer with scar formation, and dilatation of the stomach. We would remind the reader that it is assumed throughout this article that a tumor is palpable. Considerations relating to the diagnosis of these conditions previous to the appearance of a palpable tumor must be sought in more special articles.

When a tumor is found in the neighborhood of the stomach, two questions must be answered: Does the tumor arise from the stomach, and what is its nature?

Cancer of the Stomach.—The subjective symptoms resulting from cancer of the stomach vary greatly—in one case being prominent, in another almost wanting. There is, moreover, no necessary proportional relation between

the size of the tumor and the intensity of the symptoms. The symptoms also vary with the site of the carcinoma; in fact, this has a very marked influence upon the intensity of the symptoms. Cancer at the cardia or pylorus need not be large to cause very marked symptoms, while one on the curvatures of the stomach may be very large and yet cause almost no subjective symptoms.

In general there are symptoms pointing distinctly to the stomach, but these symptoms are not peculiar, for they consist of a loss of appetite, especially a loss of appetite for meats, distress and fullness after eating, eructations both gaseous and acid, pain either constant or after eating, nausea, and vomiting. These are symptoms which may occur with any disease of the stomach, but when they begin late in life, especially if the patient has always been free from gastric disturbances, they should always suggest the possibility of a cancer of the stomach. When in addition to these, the patient vomits the well-known coffee-ground vomit, the possibility becomes almost a probability. Along with these gastric symptoms there develops a progressive, secondary anæmia, accompanied by leucocytosis, and in time the cancer cachexia, with its peculiar earthy-colored skin, emaciation, and œdema, appears, and gives the patient so peculiar a look that the diagnosis can often be made on sight.

Examination of the functions of the stomach often gives most valuable assistance in the diagnosis. More attention has been paid to the secretory function of the stomach than to its other functions, although a consideration of all three is important. Briefly summarized, the result of the study of the gastric secretion is as follows: In almost all cases of cancer of the stomach the hydrochloric acid eventually disappears, but is often present until late, and may be present until death. It may be present even in excessive amounts. There are a large number of other diseases of the stomach in which also no hydrochloric acid is found; one might even say that there is no disease which may not cause absence of hydrochloric acid. One must, therefore, give up the idea formerly current that an absence of hydrochloric acid is pathognomonic of cancer of the stomach, and be content with the fact that it is more frequently absent with cancer than with any other one disease of the stomach. The inverse statement of this proposition is of much more practical value. The continuous presence of hydrochloric acid speaks strongly against a carcinoma, but does not absolutely exclude it, as it is found until death in about ten per cent. of the cases.

Lactic acid is found in many cases of cancer, but is absent in many, and present in other conditions in which the food stagnates and ferments, so that the presence of lactic acid does not have the diagnostic value at first assigned to it.

The absorption time is prolonged in most cases of cancer. The motive power is lessened.

Far more significant than all of the symptoms so far enumerated is the demonstration of a tumor in the region of the stomach. Such a tumor mass can be found in about eighty per cent. of all cases, but unfortunately its demonstration often occurs late, long after the time when surgical interference is advisable. When a tumor connected with the stomach is found in a person who is over thirty and who has beginning cachexia, the diagnosis of cancer becomes certain. Without the demonstration of a tumor the diagnosis of a cancer of the stomach is merely one of greater or less probability. The more advanced the age, the more marked the cachexia, the more conspicuously gastric symptoms are present and symptoms of other diseases are absent, the greater this probability becomes.

In some cases the tumor manifests itself, upon inspection of the abdomen, as an irregular mass in the epigastrium or lower in the abdomen, often moving freely up and down with the respiratory movements. The distention of the stomach sometimes has an effect upon the ease with which the tumor is seen. It may make the tumor visible or may completely obscure it. Inspection often gives im-

portant information as to the size, shape, and location of the stomach as a whole. Because of the emaciation, the abdominal walls are thin and through them the outlines of the stomach, filled either with gas or with fluid, are often distinctly seen.

Palpation shows a hard, usually irregular tumor mass, which may or may not be sharply circumscribed. It is usually tender on pressure, but not so much so as an ulcer. The mass is usually not movable, but may be so; even tumors of the pylorus, which one would expect to be always fixed, are sometimes very movable. It is often stated that tumors of the stomach do not move up and down with respiration, but it is certain that they do so frequently, even when not adherent to the liver, spleen, or diaphragm. This is true of cancer of the pylorus as well as of cancer of the body of the stomach.

Having demonstrated a tumor which might arise from the stomach, how shall we determine whether it does come from the stomach or not? Aside from the physical signs one must consider the subjective symptoms of the disease, and whether these point to a disease of the stomach or of some other organ, and must never forget that the cancer of the stomach is by far the most common tumor in this region, and in general, therefore, the diagnosis of a cancer of the stomach has a greater degree of probability than a diagnosis of some other tumor or some other point of origin than the stomach.

If a tumor always lies within the borders of the stomach dulness or tympany, according as the stomach is filled with fluid or with gas, the tumor arises from the stomach. If an area of tympany can be demonstrated between the tumor and the liver, the tumor does not arise from the liver and probably not from the gall bladder. Cancer of the gall bladder, because of its close anatomical relation to the pylorus, may be confused with cancer of the pylorus; but the symptoms of gastric disturbances, and especially the dilatation of the stomach almost always present with a cancer of the pylorus, are absent, and a history of biliary colic is often present.

Tumors of the spleen may be confused with tumors of the fundus of the stomach, but their regular outlines and oval shape, smooth surface, and extension up under the ribs, together with the absence of gastric symptoms, are usually sufficient to make the differentiation easy.

Tumors of the pancreas lie deeply in the abdomen, are not movable, and are apt to be accompanied by signs of compression of the common bile duct or the portal vein.

The following table from Boas' "Disease of the Stomach" shows the very important relations of tumors of this region to the distended stomach and colon:

	Inflation of Stomach.	Inflation of Colon.
Stomach.		
(a) pylorus.....	Displaced to the right and down.	Displaced upward.
(b) anterior wall and greater curvature.	Feel larger and borders less distinct.	
(c) lesser curvature.	Disappear completely..	
Liver.....	Displaced upward and to the right, and borders of organ more easily palpable.	Displaced upward; tumors of gall bladder also forward; very large tumors may be unaffected.
Spleen.....	Displaced to the left and often downward also.	Displaced up and to the left.
Colon.....	Displaced down.....	Not displaced up.
Kidney.....	At first displaced up a little, then disappear backward. The movable kidney returns to place.
Omentum.....	Displaced downward... Disappear behind stomach.	Displaced downward.

In some cases the development of secondary deposits in other organs is the first thing which proves the nature of the gastric process. For example, tumors of the liver are common in the course of cancer of the stomach, and because of their size they may distract the attention from

the stomach and lead to an erroneous diagnosis of cancer of the liver, for here as elsewhere the secondary tumors may far exceed the primary in size. Another site for secondary deposits which may lead to a correct diagnosis of the primary disease, is a lymph gland just above or behind the inner end of the left clavicle. This gland is not infrequently the site of secondary cancer that has developed from cancer of the stomach.

Ulcer of the Stomach.—Ordinarily there is no need for differentiation between this disease and cancer of the stomach after demonstration of a tumor in connection with this organ, for this usually is proof of the existence of a cancer. Sometimes, however, a scar in the base of an ulcer or an hypertrophy of the neighboring muscular layer of the stomach may cause a palpable tumor. Under such circumstances differentiation is necessary and usually difficult. Attention must be given to the following points: Ulcer is a disease of the first half of life and is more common in women than in men. It causes a good deal of pain, which is much influenced by the taking of food. Generally the epigastrium is more tender from an ulcer than from a cancer. The course of an ulcer is longer, lasting even for many years. It causes hemorrhages which are usually more abundant than those caused by cancer. Ulcer causes a secondary anemia, but not cachexia. Inasmuch as a tumor from cancer is common and from ulcer very uncommon, there must be very strong evidence in favor of an ulcer over a cancer, in any case in which a tumor in connection with the stomach is palpated.

Dilatation of the Stomach.—This often causes an easily visible, localized bulging of the abdomen in the region of the stomach. The stomach in such cases is often displaced downward, so that both the greater and the lesser curvature are visible. In many of these cases, notably those in which the dilatation of the stomach is due to pyloric stenosis, there are very manifest peristaltic movements of the stomach, exaggerated because the hypertrophied muscle layers of the stomach are trying to overcome the obstruction to the outflow of the stomach contents. The waves of motion pass from left to right. They may appear spontaneously or only after stimulation. Palpation of this bulging area gives a peculiar resistance and elicits both palpable and audible splashing, which, however, is not peculiar to gastrectasis, for it is found also in health, though not to the degree present when the stomach is dilated. Percussion of the stomach, both when filled with gas and when filled with fluid, is our most valuable means of determining the size and location of the stomach.

These physical findings, together with the history of gastric symptoms and the vomiting of large amounts of material—amounts far in excess of the normal capacity of the stomach—are enough to demonstrate the nature of the bulging of the epigastrium. The diagnosis of the cause of the dilatation of the stomach is a very different and a much more difficult problem.

TUMORS OF THE PANCREAS.

Practically the only diseases causing palpable tumors of the pancreas are the cancer and the cysts. It must, however, be remembered that when the abdominal walls are thin and relaxed, the head and even the body of the normal pancreas may sometimes be palpated. The pancreas lies deeply in the abdomen and is so attached that it does not show any respiratory or passive motility. Its anatomical relation to the transverse colon and its mesentery is such that tumors of the pancreas, when large enough to displace the colon, displace it downward, rarely directly forward, and almost never upward. This is often the most important fact in the differentiation of tumors of the pancreas from tumors arising from neighboring organs.

Cancer of the Pancreas.—This is a relatively rare condition, but is by far the most common disease of the pancreas. The symptoms consist of a combination of the effects of pressure upon the neighboring organs, of altera-

tions in the function of the pancreas, and, in about twenty to twenty-five per cent. of the cases, of the presence of a tumor. The character of the symptoms depends in part upon the portion of the pancreas affected. This is oftenest the head. There are, first, symptoms of gastro-intestinal disturbances, such as anorexia, dyspepsia, vomiting, and other manifestations of gastrectasis; fatty stools; often very large stools; pain, either constant or in the form of very severe colic; gradually developing and persistent jaundice, often with no increase or with only moderate increase in the size of the liver; marked distention of the gall bladder; ascites with enlargement of the spleen; and glycosuria in some cases.

When a tumor is palpable it lies deeply, varying greatly in size, but is smooth or irregular, not sharply outlined, and usually lies to the right of the median line. In most cases the tumor is fixed, and shows neither passive nor respiratory motility. Exceptions to this rule do occur, especially when the tumor is in the tail of the pancreas. Inflation of the colon shows it to lie below, i.e., on the caudal side of the tumor. Because of the close relation to the aorta the tumor often seems to pulsate, but the pulsation is a mere up-and-down pulsation, not expansile. When ascites is present, paracentesis is often necessary before the tumor can be palpated.

The two most important symptoms are the icterus and the presence of a tumor. The icterus is chronic, gradually progressive, intense, and once established does not disappear. The tumor must be differentiated from tumors of other organs in this neighborhood. Cancer of the transverse colon is more superficial, is movable, is associated with difficult movements of the bowels, and is free from ascites and jaundice, as a rule; stools are not fatty. Cancer of the pylorus lies more superficially, is more movable, is accompanied by changes in the gastric secretions. It does not cause fatty stools and is less often associated with icterus and ascites.

Tumors of the duodenum and of the ductus choledochus are far more difficult, often impossible, to differentiate from tumors of the pancreas.

It is said that cachexia develops much earlier with cancer of the pancreas than with cancer of other organs, and is accompanied by more severe pain than in the case of cancer of a neighboring organ.

Cysts of the Pancreas.—The demonstration of a cyst is preceded by a longer or shorter period of obscure dyspeptic disturbances, pain and emaciation. The pain is either paroxysmal and colic-like or constant. The paroxysmal pains are said to occur with no other abdominal cyst than the pancreatic cyst. Disturbances in the bowel movements, fatty stools, icterus and ascites—in short, all of the symptoms of cancer of the pancreas except those resulting from the nature of the cancerous tumor—may appear.

The cysts usually cause some, maybe immense, enlargement of the abdomen, beginning usually in the epigastrium, but later it may sink lower in the abdomen. The surface is smooth, often fluctuating. Usually the cyst shows no motility, but it may in some cases. The stomach may lie above, in front of, or below the cyst. The same is true of the colon, but almost always the colon lies below, i.e., to the caudal side of the cyst. Puncture of the cyst yields fluid varying greatly in character, and showing nothing absolutely peculiar except in those cases in which the pancreatic ferments are found in the fluid.

These cysts must be differentiated from other abdominal cysts, especially the echinococcus cysts, the hydronephrosis, and the ovarian cysts. The echinococcus cysts will be recognized by the demonstration of the hooklets and scolices in the fluid. Whether the cyst arises from the pancreas or from some other organ, is usually plain when the relation of the cyst to the colon is discovered. Ovarian and pancreatic cysts are often confused, but attention to the history, especially the early history, of the tumor, and to the portion of the abdomen where it first appeared, and to the relations between cyst and colon, will remove any doubt. If the fluid obtained by puncture shows pancre-

atic ferments, the cyst must be from the pancreas. The absence of these ferments does not prove that the cyst is not from the pancreas.

Hydronephrosis usually gives a history of urinary symptoms, renal colic, and lumbar pain, and an appearance of the tumor in the flanks. The colon lies in front of the hydronephrosis. Fluid from the hydronephrosis shows urea, sometimes uric acid, and may contain cells from the pelvis of the kidney. Catheterization of the ureters, or the collection of the urine which comes from each kidney separately, may assist.

TUMORS OF THE SPLEEN

are of two sorts—diffuse splenic tumors, none of which are new growths in the ordinary use of this term, and localized tumors of the spleen. The former group is common, the latter quite uncommon. The diffuse splenic tumors, although due to widely varying pathological processes, have some peculiarities in common, i.e., they retain the general shape of the normal organ. Even when greatly enlarged, the spleen retains its elliptical shape, with a notch in the lower part of the anterior border, and, though thickened, is still much greater in all dimensions than in thickness. The long axis of the spleen passes from the left above, downward and to the right, although in cases in which there is much enlargement the long axis is often more nearly parallel to the long axis of the body than is encountered in the normal individual. The enlarged spleen usually occupies the upper left-hand quadrant of the abdomen, but it may be displaced to any other portion, when it often occasions great difficulty in diagnosis.

The methods of examination are in general as outlined above, but many are inclined to place too much value upon percussion and too little upon palpation. The size of the splenic dulness may be decreased by the tympany of stomach or colon, or increased by dulness in either of these organs. In either case the percussion of the spleen is valueless. Palpation of the spleen is liable to fewer errors and should therefore be preferred. The patient should lie upon the back or obliquely upon the right side; the physician should stand upon the left of the patient, with the left hand making pressure forward over the lumbar region. The right hand should palpate from in front during both quiet and forced inspiration. A normal spleen, unless dislocated, cannot be palpated. Note the shape, size, firmness, tenderness, and motility of the organ. The shape, position, and motility of the organ are so peculiar that there is rarely any difficulty in recognizing that a splenic tumor is really what it is. In doubtful cases the relation of the tumor to the colon and the stomach should be ascertained by distention of these organs with gas. The spleen lies external to the stomach, above and in front of the colon. It is very rarely that the colon passes in front of the spleen.

Auscultation of the spleen rarely gives any results, but sometimes one hears venous hums similar to those heard in the large veins of the neck. In cases of perisplenitis one sometimes finds localized friction.

Exploratory puncture of the spleen is at times a valuable aid, but is not entirely free from difficulties and dangers.

Acute splenic tumors are seen in a very wide range of acute infectious diseases; in fact, there is no one of these diseases which may not cause acute swelling of the spleen. Certain of them, like typhoid fever and malaria, do so with such constancy that the want of the splenic tumor throws some doubt on the correctness of the diagnosis. Such enlargements of the spleen develop rapidly and present the shape and motility of the normal spleen. The degree of enlargement varies, but may be very considerable. Usually there is no tenderness and the spleen feels soft, but there are marked exceptions to this rule. The diagnosis of the site of the tumor is made by attention to the position and shape of the tumor. The nature of the tumor will be recognized when the general febrile disease, of which the splenic tumor is a symptom, is recognized.

Chronic enlargements of the spleen occur as a result of certain of the chronic infectious diseases, notably malaria.

The malarial spleen, or so-called ague-cake, is seen frequently in certain regions where opportunities for malarial infection are constantly present. In such regions the condition is well known and readily recognized, but in other sections where malaria is exceptional the malarial spleen may be taken for other conditions. It presents the characteristic form, is hard, and may attain almost any size, not infrequently reaching to or even beyond the umbilicus. The nature of the enlargement is recognized by a history of prolonged malarial infection and by the exclusion of other causes of enlargement of the spleen. Examination of the blood for the malarial organisms is usually futile, for the splenic tumor may continue for many years after the infection has subsided.

Syphilis, either the tertiary stage of the acquired or the hereditary syphilis, may cause chronic splenic tumors, the true nature of which can be learned only by attention to the history.

Cirrhosis of the liver, either the atrophic or the hypertrophic form, causes a chronic enlargement of the spleen which does not differ in any way from other chronic splenic tumors, and its nature can be ascertained by recognition of the hepatic condition of which the splenic tumor is a symptom. In general the spleen is larger with the hypertrophic than with the atrophic form. The enlarged liver, the jaundice either actually present or repeatedly present in the history, the prolonged freedom from circulatory disturbances, together with the enlarged spleen, make a clinical picture not easily mistaken. The small liver, the collateral circulation upon the abdomen, the ascites, and the enlarged spleen make up the cardinal symptoms of the atrophic cirrhosis.

Amyloid Spleen.—The enlargement is similar to the other diffuse enlargements of the spleen. The essential points in the diagnosis of the nature of the process are the same as those given under the heading Amyloid Liver.

Passive congestion of the spleen occurs when the outflow of blood is obstructed. The commonest cause of this is the atrophic cirrhosis of the liver. Less often it is due to compression of the veins outside the liver by tumors or adhesions. Sometimes the spleen is enlarged from obstruction above the diaphragm, oftenest from cardiac insufficiency.

Leukæmia.—All the enlargements of the spleen so far considered have been merely symptoms of disease elsewhere in the body, and the diagnosis of the nature of the splenic tumor has been based on the recognition of the primary disease; but the leukæmic spleen is of a different class, for it constitutes an integral part of the disease. The enlargement presents no peculiarities which will enable one to distinguish it from other diffuse processes in the spleen except for the size often attained by the leukæmic spleen. It often extends to the median line and downward to the ilium; cases even larger than this are not uncommon. The liver is often but not always enlarged, and when it occurs the increase in size is uniform. The lymph glands throughout the body are often enlarged, but in many cases not. The participation of the bone marrow in the leukæmic process may be shown by tenderness or pain over the bones, but the lack of these symptoms does not mean that the medulla has escaped.

The symptom upon which the diagnosis of a leukæmia rests is the change in the blood. The blood should be examined in all cases in which the spleen is found enlarged and in all cases in which an abdominal tumor found may by any possibility involve the spleen. The characteristic blood changes consist in a marked increase in the number of white cells, while at the same time the relative percentage of the different forms of white blood corpuscles is altered. There is an absolute increase in the number of all forms, but the polymorphonuclear form is relatively decreased in number often far below the normal average of eighty per cent.; the lymphocytes, myelocytes, and eosinophile cells are relatively, as well as absolutely, increased. The degree of increase of each form differs in the different cases and in the different forms of leukæmia. It is at once evident that these blood changes differ widely from the leucocytosis in which the absolute increase in

the number of white blood cells may reach as high a figure as in leukæmia, but in the leucocytosis the polymorphonuclear leucocyte is the form increased in number, and this increase is both absolute and relative.

The changes in the number of red blood corpuscles and the percentage of hæmoglobin are in no way peculiar.

The blood changes described are peculiar to leukæmia, and upon them alone the diagnosis of leukæmia must be based.

Pseudo-leukæmia causes an enlargement of the spleen which is uniform and often extreme in degree. Ordinarily the diagnosis is not difficult, for the changes in the spleen are accompanied by similar changes in the lymph glands generally and in the liver, thus showing that the splenic tumor is merely a part of a constitutional disease. The diagnosis becomes more difficult when the case is one of splenic pseudo-leukæmia, *i. e.*, one in which the spleen alone is grossly changed. There are no characteristic blood changes in this disease, the blood showing only the findings of a severe anæmia. The red blood corpuscles and hæmoglobin are greatly decreased, but the color index is less than one. There is no leucocytosis. There is often a temperature of the chronic recurrent type.

When the lymph glands generally are enlarged the diagnosis is usually simple. Leukæmia is excluded by an examination of the blood. Generalized tuberculosis of the lymph glands is not so readily excluded, but this is a very rare disease, while the pseudo-leukæmia is not. In the cases in which the spleen alone is enlarged the diagnosis must be reached by exclusion of all other possible causes for splenic enlargement in a case presenting a progressive anæmia. Especial care must be taken to exclude the chronic splenic tumor due to an old malaria.

Chlorosis and pernicious anæmia are sometimes associated with enlargement of the spleen. This is only moderate in degree and is so insignificant when compared with the manifest blood changes that it is often overlooked.

During the course of diseases which may cause emboli, such as endocarditis, aortitis, and the like, one sometimes finds a painful and tender enlargement of the spleen suddenly developed. It is often accompanied by vomiting and chill. These are the symptoms of an infarction of the spleen, and if the embolus is simple they all disappear in a short time; but if the embolus is septic other symptoms soon appear. There are repeated chills with irregular temperature, sweating, and emaciation—in short, the constitutional disturbances common to suppurative processes anywhere in the body. The spleen increases in size, perisplenitis with friction appears in many cases, and sometimes we find fluctuation and changes in the abdominal wall, such as redness, œdema, etc. When the abscess of the spleen is large, it often pushes the diaphragm high up into the thorax, giving signs which may easily be mistaken for pleurisy with effusion. The upper border of the dullness differs in shape from that ordinarily assumed by pleural effusions, and the respiratory excursion is greater, even though less than normal. Exploratory puncture shows the presence of pus.

Neoplasms of the spleen are rare and are difficult to differentiate from simple hypertrophy of the spleen. They may be suspected when the enlargement of the spleen is irregular and nodular. When such a splenic enlargement is found, tuberculosis, syphilis, carcinoma, and sarcoma must be considered. If the individual is tuberculous, the spleen is probably tuberculous; if he is syphilitic, it is probably a gumma. If there is a carcinoma of some other organ, such as the stomach or pancreas, for example, it is probably a secondary carcinoma. If no other explanation is manifest, it may be a sarcoma.

Echinococcus cysts occur in the spleen, causing an enlargement which may be very great. The disease causes no peculiar constitutional disturbances, and the true nature of the process can be learned only by exploratory puncture and the demonstration of hooklets and scolices.

Wandering Spleen.—Because of the lengthening of its ligaments the spleen may become very movable and be found anywhere in the abdomen, although as a rule it does not descend below the umbilicus. It retains its nor-

mal oval shape with one or more notches in the anterior border. The size is often considerably increased because of congestion. Sometimes the pulsations of the splenic artery are felt at the hilus. Percussion shows the absence of the splenic dullness in the normal site, but when the spleen is pushed back into the left hypochondrium, as can be done easily in most cases, the splenic dullness reappears. The peculiar shape, the extreme motility, and the presence of tympany in the normal site of the splenic dullness are usually enough to enable one to make the diagnosis. A mass of fæces in the splenic flexure of the colon may give an area of dullness similar in site, size, and shape to the splenic dullness, but any confusion of this sort is avoided by clearing the bowels, as should be done before examination of any obscure abdominal tumor. Other very motile tumors, when about the size and shape of the spleen, such as tumors of the intestines, wandering kidney, movable tumors of the pylorus, may be taken for a movable spleen, but the fact that there is an area of dullness in the splenic region, no matter where the tumor is, will exclude a movable spleen. The difficulties of diagnosis are sometimes increased by the spleen becoming fixed in the spot to which it has been dislocated.

TUMORS OF THE KIDNEY.

The normal kidney cannot be palpated unless it happens to be displaced, a condition which is far more common than is generally supposed. If palpation is employed it is best to use both hands; the patient lying first on the back and then on the side. In making such an examination one must remember that there are various pathological processes which cause enlargement of the kidney. The diagnostician must therefore not only establish the fact that the tumor arises from the kidney, but he must also ascertain what is the nature of the underlying pathological process.

Tumors of the kidney usually cause first a fullness and bulging of the lumbar region and lateral abdominal regions. There is often a visible fullness behind. When enlarging, the kidney almost always pushes the colon and intestines forward and inward toward the median line. Their peristaltic movements are often visible in front of the tumor mass. The inner borders of the tumor may plainly be seen through the abdominal walls. Enlarged and tortuous subcutaneous veins are often visible. Pulsation can rarely be seen, and the movements caused by respiration are exceptional.

The size, consistency, and character of surface vary with the nature and duration of the process. Fluctuation is not uncommon. The vermicular movements of the intestines can sometimes be felt in front of the tumor. One may be able to insert the fingers between the tumor and the arch of the ribs, or outline the liver or spleen separately from the kidney.

Percussion is important as showing the relation of the tumor to the colon, which must often be inflated with air or gas before one makes percussion. It is also valuable in differentiating a tumor of the kidney from one of the liver or spleen. If there is an area of tympany between the tumor and the liver or spleen, the tumor does not arise from either of these organs.

Auscultation over renal tumors shows in some cases murmurs exactly like the hum heard over an aneurism.

If palpation has shown fluctuating areas in the tumor or if it is suspected that fluid is present in the mass, exploratory puncture can be made. This is not entirely without danger, but if the puncture is made from behind or well around on the side where one cannot enter the peritoneal cavity, the danger is minimal. Any fluid obtained will be found to vary with the pathological process, and may be urine, blood, pus, echinococcus fluid, etc. Sometimes small particles of the tumor may be obtained in this way and identified.

The principal tumors that require to be differentiated from tumors of the kidney are tumors of the liver, spleen, ovaries, gall bladder, suprarenals, and perirenal connective tissue.

Tumors of the right kidney differ from those of the liver in the following respects: There is often, in the case of the former tumors, an area of tympany between the two areas of dullness—that due to the liver and that due to the tumor. Then again, in renal tumors the fingers can often be pushed in between the ribs and the tumor, whereas this cannot be done when the tumor originates from the liver. Renal tumors show little or no respiratory motility, while hepatic tumors move freely during respiration. Renal tumors lie behind the tympanic area of the colon, while those of the liver lie in front of or above this area. Renal tumors may cause a slight displacement upward of the upper border of the hepatic dullness, but this is the only change which they can effect in this area. Hepatic tumors, on the other hand, often cause the normally straight course of the border of hepatic dullness to become irregularly curved.

It is often most important to obtain the urine of each kidney separately. This is a difficult procedure, especially in the male. In the case of a female it is not very difficult, by use of a cystoscope, to catheterize the ureters and thus obtain the unmixed urine, but in the case of a male this is almost impossible, and the more successful method is to employ a Harris instrument. This is so constructed as to raise a ridge in the floor of the bladder between the two ureteral openings, thus making two separate pouches for the reception of the urine from each kidney. The urine is drawn from these pouches before they are entirely filled, and thus the urine of each kidney is obtained unmixed. The successful employment of this instrument requires some skill and practice; the procedure is infinitely easier to carry out than is the catheterization of the ureters. The same instrument may be used equally well in examining females.

Hydrops of the gall bladder may sometimes be confused with a movable kidney, but its pear-like shape, its superficial location anterior to the colon, and the fact that it cannot be pushed into the normal location of the kidney are usually sufficient to enable one to differentiate the two conditions.

Tumors of the spleen differ from tumors of the left kidney in the same ways as do the liver tumors from those of the right kidney. Then, in addition, splenic tumors, as stated elsewhere, retain the shape of the normal spleen.

Cysts of the ovaries rise from below upward instead of descending from above downward, and bear quite different relations to the colon. They lie within instead of without the circle of the colon, and in front of instead of behind the intestines, as the renal tumors do.

Attention to these physical differences in the tumors and due consideration of the accompanying symptoms will almost always enable one to differentiate correctly between the different conditions. Differentiation between suprarenal and perirenal tumors and tumors of the kidney is practically impossible unless changes in the urine are present. If these are found and are of such a nature as is compatible with a renal tumor, the adrenal and perirenal tumors may be excluded. Very high blood pressure with normal urine is sometimes seen with suprarenal tumors.

A diagnosis of the nature of a tumor recognized as renal depends more upon the accompanying symptoms than upon the physical characteristics of the mass.

Hydronephrosis.—In addition to the tumor, which is essential to the recognition of a hydronephrosis, we find alterations in the composition of the urine and in the quantity excreted. The amount of the urine varies greatly, being normal in cases in which only one kidney is affected while the other is normal, and in other cases varying from anuria to continuous or intermittent polyuria. The intermittent polyuria or anuria, especially when accompanied by a corresponding variation in the size of the kidney, is characteristic. The urine may be normal or it may be mixed with pus, blood, renal elements, and crystals, especially of uric acid. Exploratory puncture of the hydronephrosis yields fluid of varying character according as we have normal or pathological urine. The presence of urea and uric acid in the