CHAPTER XIX.

THE STOMACH, LIVER, AND PANCREAS.

The Stomach.

The best methods of examining the stomach are:

1. Inspection and palpation of the epigastrium and the neighboring portions of the abdomen.

2 Estimation of the size and position of the organ after distending it with air or water.

3. Examination of the stomach contents: (*a*) fasting; (*b*) after a test meal.

By combining the results of these three methods of examination with the results of our general examination of the body—emaciation, anæmia, etc.—and with the data obtained by a careful history, we obtain all the information about the stomach which it is possible for us to make use of at the present time.

1. *Inspection and Palpation of the Epigastrium.*

(*a*) *Tenderness.*—The normal stomach cannot be seen or felt, nor can anything certain be learned in regard to it by percussion or auscultation. Tenderness in the epigastrium is so common that we can attach no significance to it unless it is extreme and sharply localized in a small area. Extreme localized tenderness is of a certain amount of value in connection with the diagnosis of gastric ulcer, but is by no means pathognomonic of it. In a small proportion of cases tenderness in the back (lower dorsal or upper lumbar region) can be elicited in cases of gastric ulcer.

(*b*) A *tumor in the epigastrium* (see Fig. 181) is of far greater importance than any other local evidence. If it occurs in an emaciated and anæmic person past middle life, is hard and nodular, and does not disappear after catharsis, it is almost invariably due to cancer of the stomach. In a young person such a tumor may be due to a mass of adhesions about a gastric ulcer. Tumors of the pancreas much less often reach the surface in this region; tumors of the liver are generally larger, and their connection with this organ can generally be demonstrated by percussion, palpation, and by their greater respiratory mobility when compared with gastric cancer.

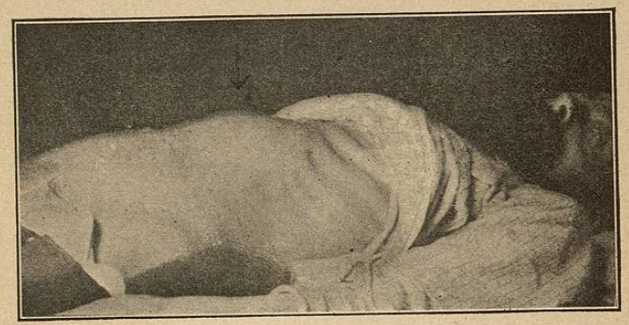

FIG. 181.—Epigastric Tumor in Gastric Cancer.

Epigastric hernia usually shows an impulse on coughing, is soft and doughy in feel, and presents none of the other symptoms and signs of gastric cancer.

Tubercular deposits in the omentum are almost always associated with ascites, fever, and other evidences of tuberculosis either in the examination of other organs or in the history.

(*c*) *Visible gastric peristalsis* means stenosis of the pylorus (cancer, cicatrix, adhesions, simple thickening, or muscular spasm). The contraction wave passes from left to right across the epigastrium, and is seen by means of the shadow cast by a tangential light with the patient in a recumbent position. If the peristalsis

stops it can sometimes be reexcited by briskly snapping the epigastric region with the finger.

(*d*) The *normal splash sound* can usually be heard if sudden, quick pressure is made in the epigastrium within three hours after a meal. If splashing can be elicited more than three hours after a meal, and especially if it is present before breakfast, it is evidence of gastric stasis and usually of dilatation.

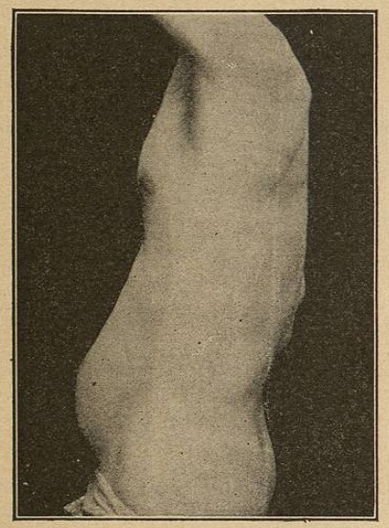

FIG. 182.—Outline of Abdomen in Dilatation of the Stomach.

(*e*) *Hypogastric bulging due to dilated stomach* is occasionally seen in cases of marked dilatation when the patient stands up, and is examined in profile (see Fig. 182).

2. *Estimation of the Size, Position, Secretory and Motor Power of the Stomach.*

Whenever we cannot arrive at a satisfactory diagnosis by means of the above methods of external examination when taken in connection with the history and the general condition of nutrition, we must undertake a more direct investigation of the organ, which begins with (*a*) the *passage of the stomach tube.* The standard red rubber tube generally in use in this country comes in two sizes. Personally I prefer the larger, with a lateral as well as a terminal opening at the lower end, although the smaller size produces somewhat less discomfort. The patient should be covered by a rubber sheet and the clothing removed from his abdomen. So prepared, he should sit in a straight-backed, wooden chair, with a good-sized foot-tub between his feet and a towel in his hand ready to wipe away the profuse secretions of the mouth and pharynx. He should then be warned that the process of passing a tube, although entirely free from danger, is very disagreeable, both on account of the nausea which it produces and because it often seems to the patient as if he were choking and could not get his breath. This, in fact, is not the case, and if the patient will persist in drawing long, deep breaths throughout the process of passing a tube, the worst of it is over in twenty seconds.

The tube is moistened with water and pushed straight down through the pharynx without any attempt to direct it, beyond keeping the median line. There is no danger of entering the trachea and no use in trying to avoid it. On its way down the tube is arrested now and then by muscular spasm of the œsophagus, but after a few seconds the spasm relaxes and allows us to push the tube on until the twenty-two-inch mark reaches the teeth. The lower end of the tube is then in the stomach,[1] and we are ready to extract the gastric contents (in case a test meal has been previously given), to wash out the organ, or to distend it with air or water.

(*b*) *Extracting the Gastric Contents.*—One hour after a test meal[2] the tube is passed and the patient is then asked to lean forward, press with his hands upon his stomach, and strain down as if he were going to have a movement of the bowels. In most cases this suffices to force the gastric contents out through the tube and into a basin, which is held ready to receive it. If the gastric contents cannot be extracted either by these manœuvres or by moving the tube against the pharynx so as to excite nausea, we should make sure first that the eye of the tube is not plugged. This may be ascertained by disconnecting the funnel and blowing through the tube, which usually suffices to discharge any obstacle from the eye of the tube. If still the gastric contents do not flow out, we may use suction by connecting a Politzer air-bag with the end of the tube in place of the funnel.

[1] Unless there is gastric dilatation or gastroptosis; then the tube must be pushed in several inches farther, the distance depending on the position of the lower gastric border, as determined in previous examinations.

[2] A slice of bread and a glass and a half of water is a good test meal.

For the analysis of the contents so obtained, see below, page 379.

(*c*) *Distending the Stomach.*—We may use either air or water. The first is more comfortable, the second rather more accurate. To *distend* the stomach *with air*, disconnect the funnel and attach a Davidson syringe. Then have the patient—still with the tube in his stomach—lie down upon a bed with the abdomen exposed, and pump air *rapidly* in with the Davidson syringe. The rapid entrance of air causes a reflex closure of the pylorus and allows us to distend the stomach. While an assistant pumps in the air, we inspect and percuss the epigastric region, which soon begins to bulge out and assume on percussion a tympanitic note differing clearly in pitch and quality from that obtained in other portions of the abdomen. After a certain amount of air has been pumped in, the lower border of the stomach (as shown by percussion) ceases to descend, and about this time the patient begins either to complain of pain or to belch up wind around the tube, showing that the organ is fully distended. We then mark upon the abdominal wall the position of the lower border of the stomach, and if possible of the upper, which can usually be obtained by percussion.

Position of the Normal Stomach.—The lower border of the normal stomach after air distention does not descend below the level of the umbilicus; hence any stomach whose lower border descends lower than this should be considered dilated, provided that the upper border is approximately in the normal situation. If the upper border is lowered as much as the fundus, we are probably dealing with a case of *gastroptosis* or dropping of the whole organ.

To *distend* the stomach *with water*, we simply pour it in through the funnel until the patient complains of decided discomfort and fulness. We then rapidly lower the funnel so that it will empty into a large foot-tub on the floor, allow the water to siphon out, and measure the amount so obtained. The normal stomach will hold about 1,500 c.c. (or three pints). Anything over this amount is pathological. A difficulty of the method of distention by water is that it is sometimes impossible to get out of the stomach all of the water that we have put into it, whereas with distention with air there is no difficulty in forcing out the air through and around the tube by pressure on the epigastrium.

(*d*) *Washing the Stomach* (*Lavage*).—Though not of much use in diagnosis, this procedure may be briefly mentioned here. After introducing the tube as above described, about a pint of water is poured in through the funnel, and, just before the water disappears in the vortex of the funnel, the latter is rapidly lowered so as to empty by siphonage into a vessel on the floor. This process is repeated until food and mucus cease to come out and the water runs clear.

To remove the tube at the end of any of the procedures just described, we have only to pinch it tightly just outside of the patient's teeth and pull it rapidly out.

3. *Examination of Gastric Contents.*

1. The *contents of the fasting stomach* are best obtained by passing the tube before breakfast, and should consist of no more than a few cubic centimetres of clear fluid containing free hydrochloric acid. If any food is present, gastric stasis is proven. If more than 50 c.c. of fluid without food are present, hypersecretion is indicated.

2. *Gastric Contents after a Test Meal.*—The best test meal is that of Ewald, and consists of a slice of bread (or its equivalent in crackers or cereal) with a glass and a half of water. After this meal not more than 100 c.c. should be found in the stomach at the end of an hour. Occasionally the stomach has emptied itself even within the hour, and we have then to reduce the period.

After extracting the gastric contents as above described and noting the quantity, we should investigate also their *color*, *odor*, *and general appearance.* (*a*) Small streaks of blood are of no consequence. Considerable quantities of blood (fresh) suggest ulcer. Small quantities of dark-brown substance resembling blood should be investigated by the hæmin test. If this is positive, gastric cancer is suggested.

The *hæmin test* is best performed as follows: Evaporate a small quantity of the suspected material to dryness on a glass slide ; next grind it up with an equal quantity of common salt, using the end

of a glass rod and thoroughly mixing the two substances; add two drops of glacial acetic acid, and heat very gently but not quite to the point of dryness. When cool, examine with a high-power dry lens. Hæmin crystals are elongated, rhombic, and dark brown in color.

(*b*) For acetic and butyric acids we test merely by our sense of smell. Whenever stasis or fermentation has occurred, we are apt to get a characteristic odor of these acids mingled with that of yeast.

(*c*) The general appearance of the contents tells us little that is important. In cases of marked dilatation they often separate into three layers—the upper frothy, the middle a thin, turbid liquid, and the lower a flocculent sediment of partially digested food.

Mucus is not of any considerable clinical significance unless it is so abundant that the whole stomach contents will slide in one lump from one beaker to another.

When absolutely no digestion has taken place, as in the rare cases of achylia gastrica, the contents consist simply of unaltered bread and water.

Chemical Tests of Gastric Contents.

1. Dip a piece of blue litmus in the contents; if no reddening occurs, no further tests need be made.

2. If the contents are acid to litmus, test with *Günzburg's reagent* (phloroglucin, 2 gm.; vanillin, 1 gm.; alcohol, 30 gm.), by mixing two drops of it with an equal amount of gastric contents (unfiltered) upon a white porcelain plate or dish, and evaporating slowly over a flame.[1] If free HCl is present, a bright rose pink appears. In the absence of free HCl, the color is a dirty yellowish-brown.

If this test is positive, we need make no further tests except the following:

Quantitative Estimation of Free HCl and of Total Acidity.

To 10 c.c. of unfiltered gastric contents add four drops (about) of Töpfer's reagent (dimethyl-amido-azo-benzol: 0.5 per cent alcoholic solution) in a beaker; a carmine-red color results. Fill a graduated burette with decinormal NaOH solution, and let it run out into the beaker, a few drops at a time, until the carmine-red color disappears. While titrating stir the mixture constantly with a glass rod. Note the number of cubic centimetres of NaOH that have run out.[1]

[1] The same test may be performed on a glass slide which is subsequently put upon a piece of white paper to bring out the color.

To estimate the quantity of free HCl, multiply the number of cubic centimetres of NaOH used in the titration by 0.0365; the result is the percentage of free HCl. Normal free HCl varies from 0.07 to 0.2 per cent, or from 2 to 6 c.c. of decinormal NaOH for 10 c.c. of gastric contents.

The estimation of combined HCl and of the acid salts is seldom of importance.

Total acidity is determined by adding to the same beaker of contents in which the free HCl has just been neutralized two or three drops of a one-per-cent solution (alcoholic) of phenolphthalein, and continuing the titration with the NaOH solution (and constant stirring) until a *permanent* red color appears. By mutiplying the number of cubic centimetres of NaOH used from the beginning of the first titration up to the point when the red color reappears by 0.0365, we obtain a figure 1 presenting the percentage of total acidity. The normal range of total acidity is from 0.15 to 0.3 per cent, and we usually find that we have used from 4 to 8 c.c. of the NaOH solution in the process of neutralizing 10 c.c. of gastric contents.

Lactic acid is to be tested for *only when HCl is absent.* The test must be made at once, since lactic acid soon develops in stomach contents which are kept in a warm place. To perform the test, we dilute a solution of FeCl (strong aqueous) with water until a faint yellow color barely remains. Then fill the concavities of two test tubes with this solution, using one for comparison. If, on

[1] An ordinary medicine-dropper may be substituted for the burette if we get an apothecary to mark with a file upon it the point to which a (previously measured) cubic centimetre of water rises when sucked into the dropper. The half-centimetre point can be similarly marked. Decinormal NaOH solution is then sucked into the dropper and expelled, one-half centimetre at a time, into the beaker containing the Töpfer's reagent and gastric contents.

adding a few drops of stomach contents to the other, a considerable intensification of the yellow color occurs, lactic acid is almost certainly present. A negative test rules out lactic acid.

The *sediment* need not be examined. It is true that sarcinæ and various bacteria (Boas-Oppler bacillus and others) are often found in cases of gastric stasis, but they add little if anything to the other evidence of stasis more easily obtained—*i.e.*, the symptoms mentioned on page 384, the presence of splashing more than four hours after a meal, the evidence of dilatation or gastroptosis as given above, and the finding of organic acids.

4. *Incidence and Diagnosis of Gastric Diseases.*

In the wards of the Massachusetts General Hospital the number of cases apparently of gastric disease treated between 1870 and 1905 was as follows:

Cancer	403
Ulcer	536
Dilatation	170
Dyspepsia[1]	1,002
Total	2,111

The data at our disposal are as follows:

1. The history.
2. The local and external examination of the epigastric region.
3. The estimation of the size and motor power of the stomach.
4. The examination of the gastric contents.

(*a*) *In advanced cancer of the stomach* we have pain, emaciation, anæmia, symptoms of fermentation (see page 384), often dilatation and motor insufficiency due to pyloric stenosis, absence of HCl in the gastric contents (often), and in many cases the presence of digested blood ("coffee grounds") in what is vomited or washed out of the stomach. But without the presence of an *epigastric tumor* all of these facts are insufficient for diagnosis. Even the

[1] *I.e.*, cases of painful digestion including anomalies of motion, sensation, secretion, "gastritis" and "gastric catarrh," but without evidence of ulcer, cancer, or dilatation.

tumor itself may deceive us, as the adhesions around a gastric ulcer may present a similar mass to the palpating hand.

The age of the patient is of great importance, especially if during the earlier decades of life he has been totally free from gastric symptoms. *Any type of dyspepsia, any sort of genuine gastric trouble,*[1] *occurring in a person over forty who has never had any such trouble before, is strongly suggestive of cancer.*

(*b*) *Gastric ulcer* gives us usually the symptoms of hyperacidity (see next paragraph) with a demonstrable excess of HCl in the gastric contents and a more or less characteristic history; but without the occurrence of *hemorrhage* with the vomiting of bright blood and perhaps tarry stools (melæna), diagnosis is never certain. Since gastric ulcer often leads to cicatricial stenosis at or near the pylorus, its symptoms are frequently complicated by those of gastric dilatation and stasis.

(*c*) *Hyperacidity* (or, more strictly, *hyperchlorhydria*) gives us usually *painful digestion, with a good appetite and a clean tongue.* Pain may come soon after a meal, and in such cases it is apt to be excited especially by eating meat, but it is oftener felt when the stomach is quite empty—*e.g.*, in the night or before a meal. It is prone to occur in chlorotic or neurotic persons or during periods of special stress and worry. It frequently leads to gastric ulcer.

(*d*) *Hypoacidity* (hypochlorhydria) is not a disease, but a symptom occurring temporarily or for a longer period in connection with various stomach troubles (dilatation, "catarrh," nervous dyspepsia), as well as in many conditions entailing general debility with stomach symptoms. Hypoacidity is often associated with stasis and fermentation. It is recognized, of course, by the chemical tests described above.

(*e*) *Gastric dilatation*, when considerable, is almost always secondary to pyloric obstruction (due to cancer, cicatrix, or adhesions). Symptoms suggesting it are the vomiting at one time of a large quantity—a quart or more—of stomach contents, often containing fragments of food eaten more than four hours previously. Such

[1] We must be careful to exclude angina pectoris as well as gall stones and their effects.

attacks of vomiting occur usually not after every meal, but at longer intervals. It is to be positively diagnosed by passing a tube and distending the stomach with air or water.

(*f*) *Gastric stasis* occurs with more or less constancy in almost every disease of the stomach and in many general constitutional diseases (tuberculosis, anæmia, general debility). It constitutes what is usually referred to by patients as "indigestion," "dyspepsia," or "sour stomach." *Fermentation of stomach contents* too long retained is the essential point. This results in a sense of weight and pressure in the epigastrium, eructations of gas and of sour or burning fluids, loss of appetite, nausea, and vomiting. The tongue is generally furred and the bowels are constipated. Headache, vertigo, and depression of spirits often accompany it.

The Liver.

The Massachusetts General Hospital records (1870–1905) show the following figures bearing on the incidence of diseases of the liver:

Passive congestion	1,288
Portal cirrhosis	234
Biliary cirrhosis (Hanot's)	0
Cancer of the liver	184
Sarcoma of the liver	2
Abscess of the liver	51
Leukæmic infiltration	46
Pseudoleukæmic infiltration	10
Amyloid infiltration	9
Fatty infiltration	6
Hydatid cyst	8
Syphilis	8
"Simple cyst"	6
Actinomycosis	3
Acute yellow atrophy	2
Tuberculosis	1
Total	1,858

Diseases of the Gall Bladder and Bile Ducts.

Gall stones	457
Acute cholecystitis	110
Catarrhal jaundice	125
Cholangitis	9
Total	701

The evidences of liver disease are two classes, local and general.

Local signs include: (*a*) Pain and tenderness in the hepatic region. (*b*) Enlargement of the organ, symmetrical or irregular. (*c*) Atrophy of the organ.

The *general signs* which assist in the diagnosis of liver disease are: (*a*) Portal obstruction. (*b*) Jaundice, including changes in the color of the skin, mucous membranes, and excretions. (*c*) Loss of flesh and strength. (*d*) Evidences of infection (fever, leucocytosis, chills, sweats, anorexia). (*e*) Cerebral symptoms (headache, vomiting, depression, delirium, convulsions, coma).

The various attempts to test the liver functions by chemical examination of urine and fæces have not as yet been successful; hence all diagnoses of liver disease must be built up of the above eight groups of data.

(*a*) *Hepatic Pain.*

This forms little or no part of many cases of liver disease, since it *occurs only when the capsule is stretched or its nerves are involved in a perihepatitis.* Many cases of hepatic abscess, for example, run their course without pain or become painful only when the pus burrows to the surface and stretches the capsule. Besides this *capsule pain* in liver disease, we have *shoulder pain* referred to the region of the right scapula, less often to other parts of the back. Capsule pain is most noticeable in cancer of the liver; shoulder pain in abscess.

Tenderness is present in the same cases which are painful, *i.e.*, those in which there is perihepatitis or stretching of the capsule by rapidly increasing tension from within. The latter condition is commonest in passive congestion, but is not characteristic of any single disease.

(*b*) *Enlargement of the Liver.*

Tumors behind the liver, pushing it forward and down, are often overlooked, because they bring the liver so prominently into the foreground and fasten our attention on what is mistaken for an enlargement of the organ. Wherever the cause of a supposed enlargement of the liver is not obvious, retroperitoneal sarcoma or some other deep-seated tumor should be suspected.

I have already alluded to the possibility of mistaking the enlarged liver for empyema, and vice versa (see above, page 352).

We are sure of an increase in the size of the liver only when we can feel its edge below the ribs and can determine by percussion that its upper border is not depressed.[1] To feel the edge of the liver, hook the fingers of both hands around the margin of the right ribs and ask the patient to take a deep breath. At the height of inspiration an edge may be felt to descend against the fingers and to push its way beneath them. Unless an edge, either sharp or rounded, is felt, one cannot be sure of hepatic enlargement, for percussion of the lower edge of the liver is notoriously unreliable Dulness below the costal margin is frequently found in cases without hepatic enlargement, and should never be relied on unless the liver can be *felt*.

The long, smooth edge of the liver descending one to two inches with full inspiration is rarely mistaken for anything else, but if the edge is irregular and the surface nodular (see below) it may be hard to distinguish liver from stomach or possibly kidney.

If ascites is present, the presence and dimensions of an enlarged liver beneath the fluid can sometimes be made out by *dipping* (see above, page 369). If this is impossible, the ascites may be tapped, after which it is usually easy to feel any enlargement that is present, as the belly walls are very flaccid.

[1] A normal liver may be pushed down by air, water, or solid tumors in the lung and pleura, so as to be palpable below the ribs; but the evidence of a cause and the low position of the upper border usually make diagnosis easy.

The *causes of hepatic enlargement* (in adults[1]), arranged approximately in the order of frequency, are:

1. Passive congestion (later stages of uncompensated heart disease).
2. Obstructive jaundice (from any cause).
3. Cirrhosis.
4. Fatty liver, including "infiltration" and "degeneration."
5. Malignant disease.
6. Syphilis of the liver (congenital or acquired).
7. Abscess of the liver.
8. Leukæmia and pseudoleukæmia.
9. Cholangitis.
10. Amyloid.
11. Hydatid cysts.

The *largest livers* are found in *malignant disease, biliary cirrhosis, and abscess.*

In *passive congestion* the liver is very tender, and the presence of uncompensated heart disease[2] usually makes the diagnosis easy. The surface of the organ is smooth and firm.

In *cirrhosis* a distinction must be drawn between (*a*) *latent* or *compensated cases*, wholly without symptoms, and (*b*) *uncompensated cases*, in which diagnosis depends on the chronic enlargement without any considerable increase under observation, associated with evidence of *portal* or *biliary obstruction* (*or both*) and without much pain or irregularity of the liver. Eighty per cent of the two hundred and thirty-four cases recorded at the Massachusetts General Hospital showed enlargement, and only twelve per cent showed pain (*cf.* Malignant Disease, below).

The *fatty liver* is soft and smooth in feel. The presence of phthisis or alcoholism makes us suspect this diagnosis, which depends largely on excluding other causes of enlargement.

Malignant disease of the liver (cancer or sarcoma) is usually sec-

[1] In infants rickets, anæmia, and gastro-intestinal disturbances are often associated with enlarged liver, though the splenic enlargement is usually much greater in such cases.

[2] Either primary or resulting from chronic bronchitis and emphysema.