seated, almost immovable tumor, the suggestion of pancreatic disease becomes more plausible.

Acute pancreatic disease, hemorrhagic or suppurative, is not recognizable until it is seen at an operation undertaken for the relief of some grave, acute lesion of the upper abdomen. Perforated gastric ulcer and intestinal obstruction may give identical symptoms, viz., sudden, intense, epigastric pain and tenderness, with vomiting and collapse. One or two days later a tender epigastric tumor may appear, but this presents no characteristic peculiarities.

Pancreatic cyst presents a very slow-growing, possibly elastic, deep-seated epigastric tumor, which usually produces little in the way of pressure effects, and may be associated with glycosuria and fatty stools.

Bronzed Diabetes.—The association of diabetes with bronzing of the skin and enlargement of the liver is strongly suggestive of chronic fibrous pancreatitis.

In any doubtful case the possibility of pancreatic disease is increased: (*a*) If improvement follows the administration of pancreatic preparation; (*b*) if glycosuria follows the administration of 100 gm. of glucose (alimentary glycosuria).

Incidence of Pancreatic Disease.

The following table is from the Massachusetts General Hospital records (1870–1905):

	Cases.
Cancer of the pancreas	35
Acute pancreatitis	13
Chronic pancreatitis	10
Cyst of the pancreas	3
Total	61

CHAPTER XX.

THE INTESTINE, SPLEEN, KIDNEY.

THE INTESTINES.

Incidence of Intestinal Disease (excluding diarrhœa and constipation) *at the Massachusetts General Hospital, 1870–1905.*

1. Appendicitis	3,314
2. Acute obstruction	142
3. Cancer (above the rectum)	155
4. Dilated colon	6
5. Tuberculosis	2
6. Fæcal impaction (above the rectum)	2
Total	3,621

Data for Diagnosis.

THE data on which are based all our conclusions regarding intestinal disease are obtained from the following sources:

1. *Pain* (colicky or steady) and *tenderness, tenesmus.*

2. *Gaseous distention* and the noises and sensations produced by gas.

3. *Diarrhœa* or *constipation.*

4. *Muscular rigidity* of the belly wall protecting an intestinal lesion.

5. *Tumor*, palpable or visible, and believed to be connected with the intestines (together with the effect of catharsis on such tumor).

6. *Visible or palpable peristalsis* (see page 364).

7. *Digital or visual examination of the rectum* (see page 441).

8. *Examination of the intestinal contents*, fæcal and other (see page 402).

9. *Inflation of the colon* through the rectum (see page 370).

10. *Indicanuria*—rarely of value.

11. *Constitutional manifestations*, such as fevers, vomiting, leucocytosis, emaciation.

Some of these data need further comment.

Intestinal Pain.—Many pains associated with intestinal disease (appendicitis, cancer) are due in fact to irritation of the peritoneum.

Which of the numerous pains referred to the belly should be interpreted as *intestinal* in origin? Those especially which (*a*) shift rapidly from place to place; (*b*) accompany the noises and sensations of the passage of gas and fæces through the intestine; (*c*) accompany diarrhœa or constipation.

Tenderness is usually a symptom of peritoneal rather than intestinal irritation. With true intestinal pain (*colic*) there is often *relief by pressure*—the precise opposite of tenderness. Yet so close is the association of intestine and peritoneum that in appendicitis, intestinal ulceration, tumors, and even in simple gaseous distention of the gut, there is often local or general tenderness. When extreme and associated with constitutional manifestations —fever, leucocytosis, collapse—it always suggests peritonitis. When there are no constitutional manifestions, a purely *local* pain or tenderness has little *diagnostic* value.

Tenesmus.—The desire to pass another stool as soon as one has been evacuated, together with local burning and straining, means always *rectal* irritation (inflammation, ulcer). It is one of the most definite and reliable symptoms known.

Gaseous distention of the intestine is proved by an *increase of the normal tympanitic* note over part or all of the belly, together with a *prominence* of the overlying belly wall. It is chiefly and most frequently the colon that produces distention.

The *significance of distention* is vague and depends largely on the associated data. In acute *gastro-intestinal "catarrh"* the diarrhœa and absence of severe constitutional manifestations make us put little stress on the associated distention. In *typhoid fever* distention results from atony of the intestinal walls and is "to some extent a measure of the intensity of the local lesions" (Osler). In *intestinal obstruction* distention may be extreme if the stoppage is low down (in the colon), less marked if the lesion is high up. In *starvation*, children often get very large bellies, owing to muscular

atony of the gut and the resulting gaseous accumulation. But in no case is the distention of itself of much diagnostic value. The associated symptoms give it significance.

Diarrhœa, the passage of more and looser stools than is normal for the individual, is, like distention, a result of many causes both within and outside the intestine.

The most important are:

1. Intestinal disease. $\begin{cases} (a) \text{ Indigestion (acute and chronic).} \\ (b) \text{ Ulceration (some cases only).} \\ (c) \text{ Infectious diseases (cholera, dysentery, typhoid).} \\ (d) \text{ Intestinal parasites.} \end{cases}$

2. Outside influences. $\begin{cases} (a) \text{ Nervous causes (emotion, Basedow's disease, etc.).} \\ (b) \text{ General infections (sepsis).} \\ (c) \text{ Cachectic states (anæmias, nephritis, etc.).} \end{cases}$

By a search for these causes, as well as by the use of the data obtained by examination of the stools, we arrive at an understanding of the diagnostic significance of diarrhœa.

Aside from diarrhœa and constipation, which produce no physical signs beyond those already described—distention, borborygmi, pain, tenderness, tenesmus, and constitutional manifestations— there are but three important lesions of the intestines:

I. Appendicitis.

II. Intestinal obstruction.

III. Cancer of the bowel.

I. Appendicitis.

1. The local signs are pain, tenderness, muscular spasm, and tumor.

2. The general or constitutional signs are fever, chill, rapid pulse, vomiting, constipation, frequency or cessation of micturition, and leucocytosis.

(*a*) The *pain* may be at first general, later localizing itself in the right iliac fossa, less often near the navel, the gall bladder, or in any other part of the belly.

(*b*) The *tenderness* is more important in diagnosis; indeed, without tenderness diagnosis is rarely possible. It is usually greatest

near a point half-way from the anterior iliac spine to the navel. Occasionally a tender point in the pelvis may be reached by rectal examination.

(*c*) *Muscular spasm* over the appendix region is present in most cases, and, while it renders accurate palpation impossible, it is in itself so characteristic of the disease that we do not regret it.

Psoas spasm occurs in a minority of cases. The patient leans his body forward and toward the right in walking, or, if recumbent, draws up the right thigh to relax the spasm.

(*d*) *Tumor*—about the size and shape of a lemon, ill-defined and tender—is felt in the right iliac fossa in many cases. It may be considerably larger and better defined if abscess has existed for several days, or it may be smaller and more sausage-shaped.

(*e*) The *constitutional signs* may or may not be marked, according to the duration of the process, its virulence, and the degree of infection of the peritoneal cavity. The fever is usually moderate, under 102.2° F., with corresponding elevation of the pulse. Vomiting comes at the outset if at all, and is usually over by the second day. A leucocyte count which rises or remains elevated (above 16,000) accompanies the active and advancing stages of the disease. In cases that are very mild or tightly walled in by adhesions, and in cases with virulent general peritonitis, the leucocytes may be normal or subnormal.

Diagnosis can hope only to establish the existence of a local inflammatory process in the abdomen; acute cholecystitis and acute pus tube may present signs indistinguishable from those of appendicitis, though the site of tenderness often sets us right. Non-inflammatory processes, such as biliary and renal colic, floating kidney, and acute gastro-intestinal upsets, can usually be excluded, since they do not show so much local tenderness, fever, and leucocytosis.

In young women familiar with the symptoms of appendicitis, a vivid imagination may conjure up a set of sensations that are difficult for the physician to distinguish from those of the actual disease. Even tenderness may be simulated, but, by distracting the patient's attention while we palpate, we may be able to press hard over the appendix without eliciting complaint. The absence of leu-

cocytosis, the age and sex of the patient, also help us to exclude appendicitis.

II. *Intestinal Obstruction.*

(*a*) *Acute Obstruction.*—A person may have had no fæcal discharge for a week or even considerably longer and yet present all the evidences of good health. It is only when *vomiting*, severe paroxysms of *pain*, and *distention* of the belly ensue that we suspect obstruction. In the acute cases *tumor* is noted in only about fifteen per cent. In the chronic cases, usually due to stricture or cancer, a fæcal tumor can often be felt and diarrhœa may alternate with constipation.

By physical signs alone I do not believe that general peritonitis and acute intestinal obstruction can always be distinguished. Fever is not distinctive of general peritonitis, for it occurred in eighty-four out of one hundred and twenty-two cases of acute obstruction in the Massachusetts Hospital records, and in forty-three of these cases free fluid in the peritoneal cavity was demonstrated as well. Stercoraceous vomiting may occur in general peritonitis; it was absent in three-fourths of the Massachusetts Hospital cases of obstruction. Weak, rapid pulse, cold extremities, and a drawn, anxious face are common to both diseases. Tenderness is more general and more marked in general peritonitis than in simple obstruction, yet some tenderness was complained of in fifty-six out of the one hundred and twenty-two cases of obstruction just cited.

On the whole, the differential diagnosis of these two diseases seems to depend far more on the history and the etiology than on physical signs.

(*b*) *Chronic Obstruction.*—Here the diagnosis is simpler. There is usually a history of increasing constipation sometimes interrupted by occasional attacks of diarrhœa.[1] *Tumor* is palpable in fifty-eight per cent of cases. *Visible peristalsis* was recorded in seventeen per cent of the Massachusetts Hospital cases. Distention is gradual and late. Cachexia is frequently present. Cancer of the colon, usually at the sigmoid or cæcum, is the commonest cause. Stricture, except cancerous stricture, is rare.

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[1] The latter combination occurred in six per cent of the Massachusetts Hospital cases.

(c) *Acute Obstruction by a Chronic Lesion.*—Cancer of the sigmoid often exists for months almost latent, or produces only moderate constipation, so that the patient considers himself well. Such cancers present an annular growth, hardly bigger than a signet-ring, practically an annular stricture.

This stricture may be suddenly "*shut down*" during an acute gastro-intestinal attack, and we are then confronted with all the signs of acute obstruction. Only the seat of the lesion, the age of the patient, and possibly the appearance of peristaltic waves can lead us aright in our diagnosis of the cause of obstruction.

III. Cancer of the Bowel.

The signs are usually those of chronic intestinal obstruction (see last section) with a well-defined tumor. Occasionally the tumor may not produce much obstruction, and we have simply pain and a tumor which we find by examination is not attached to the liver, spleen, kidney, or stomach, and usually about the size of a hen's egg. If fæces have accumulated behind such a tumor, we may feel larger masses. In my experience palpable tumors due to fæcal impaction alone, without organic stricture or cancer, are very rare, except in the rectum or lower sigmoid; if found above this region they are almost invariably dependent on stricture or cancer of the bowel.

Examination of Intestinal Contents.

1. *Weight.*—With the average diet of the adult "Anglo-Saxon," the weight of the daily stool is from 100 to 250 gm. (about 25 to 70 gm. dry), but Chittenden has shown that with a low proteid diet of 2,000–2,750 calories value, the weight of the stool may be less than half this amount.[1]

2. *Color.*—(*a*) White or light yellow—milk diet, bread and milk diet.

(*b*) Black—blood, bismuth or iron (medicinal), blackberries, huckleberries, red wine.

[1] "Physiological Economy in Nutrition," 1904, p. 42.

(*c*) Green—normal infant's stool after standing; fermented infant's stool if green when passed; green vegetables, calomel.

(*d*) Gray—absence of bile (jaundice), sometimes after cocoa or chocolate.

(*e*) Bloody red—if in small amount and fresh, usually due to hemorrhoids; in large amounts it may also be due to hemorrhoids or to any of the causes of intestinal ulceration (typhoid, cancer, dysentery, etc.).

3. *Odor.*—In adults of no great significance. In infants foul stools suggest albuminoid decomposition, and strongly sour stools suggest acid fermentation.

4. *Abnormal Ingredients.*—(*a*) *Undigested food* in small quantities is present in normal stools, but when digestion is faulty larger quantities easily recognized by the naked eye may occur. Pieces of meat, flakes of casein (especially in typhoid patients overfed with milk), fragments of starchy food, and lumps of fat (steatorrhœa) may be seen.

The natural inference from the presence of these substances is that the gastro-intestinal tract is not at present dealing with them satisfactorily. Fatty stools are present in jaundice, tuberculosis, or amyloid of the intestine, and even in simple catarrh. Though often associated with pancreatic disease, fatty stools are by no means characteristic of it.

(*b*) *Mucus.*—Small shreds of mucus adherent to fæces are of no importance and cause much unnecessary worry among anxious mothers. Larger amounts, if intimately mixed with the stool, point to catarrh of the small intestine; if mucus thickly coats or makes up the bulk of the stool, the trouble is in the colon. The latter is by far the commonest condition. Anything from a very mild to a severe catarrhal condition is accompanied by mucus.

(*c*) *Fresh Blood.*—Piles are by far the commonest cause of bloody stools, and the amount of blood may be trifling or may be large enough to produce in time a severe anæmia.

Enteritis (the mild follicular or the severe ulcerative form) often produces bloody stools. The associated symptoms, diarrhœa, mucus, and pain, together with the etiology (dietetic error,

typhoid fever, amœba coli), must determine the nature of the enteritis.

In *cancer* of the rectum or sigmoid (rarely higher up in the bowel), small quantities of blood, fresh or altered, are almost always passed sooner or later. The infrequent, offensive, and painful stools and the results of digital examination usually reveal the source of the blood.

In *intussusception* the association of bloody stools with the sudden appearance of a painful abdominal tumor (usually in the cæcal region), vomiting, and severe constitutional manifestations suggest the diagnosis.

In *hemorrhagic diseases* (purpura, scurvy, acute leukæmia) blood may come from the intestine as well as from the other mucous membranes. Other rare causes for blood in stools are a ruptured aneurism, thrombosed mesenteric artery, rectal syphilis, or fissure.

(*d*) *Altered blood* (tarry stools, melæna) follows the pouring out of blood—a pint or more—in the upper gastro-intestinal tract, and occurs in hepatic cirrhosis, gastric or duodenal ulcer, after severe nose-bleed, and occasionally from other causes.

(*e*) *Pus* is not of great diagnostic value. Large amounts mean the breaking of an abscess (appendix, pus tube) into the rectum. Small amounts occur in ulcers or even from catarrh.

(*f*) *Shreds* of tissue point to ulceration.

(*g*) *Gall Stones.*—In suspicious cases break up the fæces in a sieve with plenty of water. The peculiar, *facetted* shape of most gall stones should be familiar to the student from the study of museum specimens. If the patient has been taking olive oil in large doses, pseudo-concretions made up of fæcal matter and oil may deceive the inexperienced.

Intestinal Parasites.

Bacteria.—Only the tubercle bacillus can be recognized without culture methods, which do not fall within the scope of this book.

For the identification of tubercle bacilli the following method is to be recommended: "Dilute the stool with ten volumes of water, mix thoroughly, and let it stand in a wide-mouthed bottle for
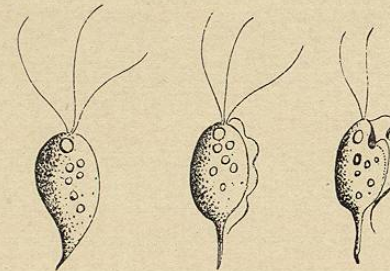
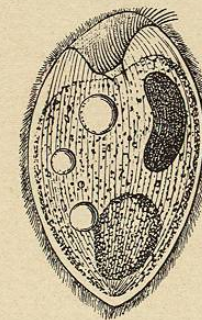FIG. 1.—Trichomonas hominis. (Leuckart.)

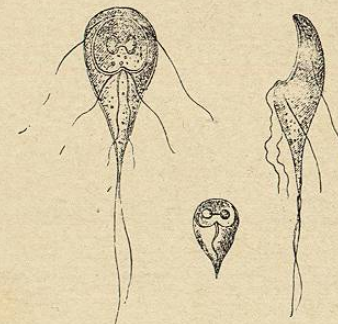FIG. 2.—Balantidium coli. (Leuckart.)   Magnified about 150 diameters.

FIG. 3.—Lamblia intestinalis. (Leuckart.)

twenty-four hours.   The narrow layer between the thin supernatant liquid and the solid sediment contains the bacilli.   Remove this with a pipette, spread it on a cover slip, evaporate slowly to dryness, and proceed as with sputum" ("Harvard Outlines of Medical Diagnosis," 1904, p. 29).

Animal Parasites.

The most important are:

I. Serious...... { 1. Amœba coli.
{ 2. Hook-worm { (*a*) Uncinaria americana.
{ (*b*) Anchylostoma duodenale.

II. Mild. ....3. Tape-worms: the beef-worm (Tænia saginata) is very common; the pork-worm (Tænia solium) is rare; the miniature tape-worm (Tænia nana) and the fish-worm (Dibothriocephalus latus[1]) are fairly common.   Several other forms occur in foreign countries.

III. Usually harmless. {
4. Ascaris lumbricoides (round-worm).
5. Oxyuris vermicularis (thread-worm; pin-worm).
6. Trichiuris trichiura (whip-worm).
7. Strongyloides intestinalis.
8. Trichomonas intestinalis.
9. Lamblia intestinalis.
10. Balantidium coli.
11. Bilharzia hæmatobium.

Tape-worms, round-worms, pin-worms, and the strongyloides are to be recognized in their adult form (see Figs. 183, 184, 185, 186, 187).   They are usually noticed by the patients themselves and brought to the physician for examination.   If the worm has the look of a common earth-worm, but a length of five to nine inches, it is safe to call it the "round-worm" (Ascaris lumbricoides); if the worm is about one-half an inch long and as thick as a pin, it is in all probability a "pin-worm" (Oxyuris vermicularis).

The *Amœba coli* is to be searched for in fresh stools passed into a warm vessel.   A bit of mucus from such stools is put upon a warmed slide with a drop of water, covered with a cover glass, and examined at once with a high-power dry lens.   It is recognized by

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[1] Fish tape-worms may produce a severe anæmia, but in probably the great majority of all cases they do not do so.

the presence of *distinct amœboid movements.* When dead it assumes a round shape, but one should not attempt a positive diagnosis unless live amœboid parasites are present.

The other parasites are identified, as a rule, by the finding of their eggs in the stools. The technique of this operation is described below, as exemplified in the search for the egg of uncinaria—at present the egg most important for Americans to recognize.

Eggs of parasites catch the eye in the examination of stools, *first* of all, by the clean-cut, *mathematical symmetry of their oval,* when com-
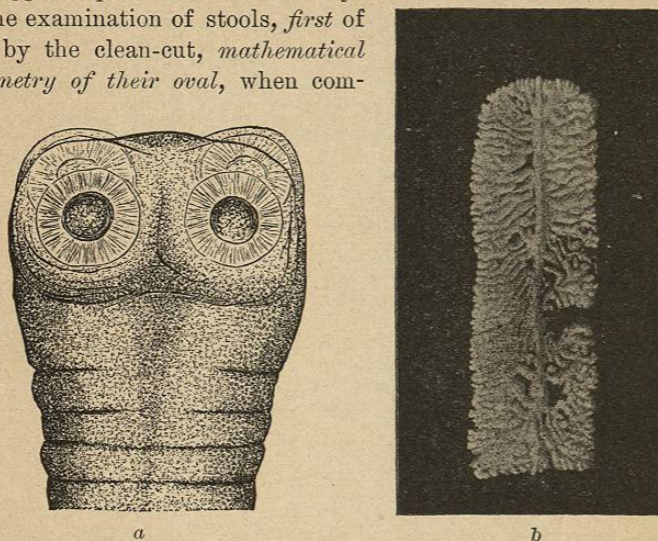
FIG. 183.—*a,* Head of Tænia saginata, much magnified; *b,* uterine canal of same. About twenty branches on each side.

pared with the irregular, shapeless masses which usually appear in slide and cover preparations from the fæces.

Secondly, the *size* of parasitic eggs is greater than that of most of the objects seen in the fæces; and, *thirdly,* they are for the most part dark brown, *stained with bile* (the uncinaria is an exception).
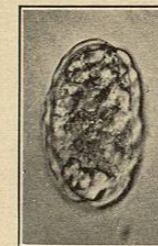
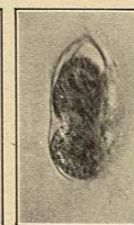The differences between individual species will be described later. In Plates II. and III. the most important eggs are pictured and catalogued.
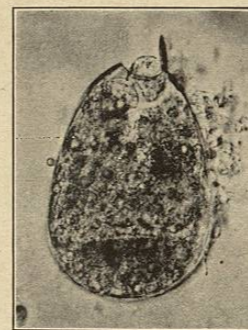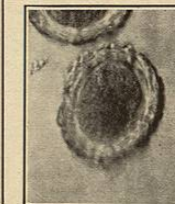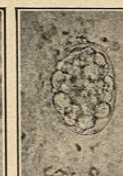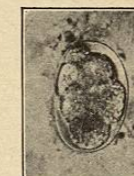
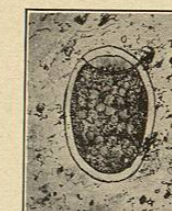Distoma buski.　　　　Ascaris lumbricoides.

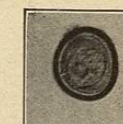Uncinaria americana.　　　　Anchylostoma duodenale.

Trichuris trichiura.　　Dibothriocephalus latus.　　Tænia solium.　　Tænia saginata.

EGGS OF INTESTINAL PARASITES.

All are magnified 250 diameters.