Dilatation of the sigmoid flexure occurs particularly when this portion of the bowel is congenitally very long. In such cases the bowel may be so distended that it occupies the greater part of the abdomen, pushing up the liver and the diaphragm. An acute condition is sometimes caused by a twist in the mesocolon.

There is a chronic form in which the gut reaches an enormous size. The coats may be hypertrophied without evidence of any special organic change in the mucosa. In a specimen which I saw with W. E. Hughes, in Philadelphia, the colon was enormously dilated and held fourteen pints of water, and the sigmoid flexure was four inches in diameter. It was removed from a boy, aged three, who had had obstinate constipation and at the age of two an attack of entero-colitis. At one time he was nineteen days without a passage; on another occasion twenty-four. The abdomen was enormously distended, everywhere tympanitic. The hypertrophy of the bowel-wall was much greater toward the sigmoid flexure than near the cæcum. In the section on Constipation in Infants a case is referred to in which the colon and sigmoid flexure appeared to be dilated.

Infarction of the Bowel.—The mesenteric vessels are terminal arteries, and when blocked by emboli or thrombi the condition of infarction follows in the territory supplied. Probably the occlusion of small vessels does not produce any symptoms and the circulation may be re-established. If the superior mesenteric artery is blocked a serious and fatal condition follows. Three instances have come under my observation. In one, a woman aged fifty-five was seized with nausea and vomiting, which persisted for more than a week. There was pain in the abdomen, tympanites, and toward the close the vomiting was incessant and fæcal. The autopsy showed great congestion, with swelling and infiltration of the jejunum and ileum. The superior mesenteric artery was blocked at its orifice by a firm thrombus. In the second case, a woman aged seventy-five was seized with severe abdominal pain and frequent vomiting. At first there was diarrhœa; subsequently the symptoms pointed to obstruction, with great distention of the abdomen. The post-mortem showed the small bowel, with the exception of the first foot of the jejunum and the last six inches of the ileum, greatly distended and deeply infiltrated with blood. The mesentery was also congested and infiltrated. The superior mesenteric artery contained a firm brownish-yellow clot. There were many recent warty vegetations on the mitral valve. In the third case, a man aged forty was suddenly seized with intense pain in the abdomen, became faint, fell to the ground, and vomited. For a week he had persistent vomiting, severe diarrhœa, tympanites, and great pain in the abdomen. The stools were thin and at times blood-tinged. The autopsy showed an aneurism involving the aorta at the diaphragm. The superior mesenteric artery, half an inch from its origin on the sac, was blocked by a portion of the fibrinous clot of the aneurism. In the horse, infarction of the intestine is extremely common in connection with the verminous aneurisms of the mesenteric arteries and is the usual cause of colic in this animal.

III. APPENDICITIS.

(*Typhlitis and Perityphlitis*).

This is one of the most important of intestinal affections. Unfortunately, much confusion still exists about the forms of inflammation in the cæcal region. Thus there are recognized *typhlitis*, inflammation of the cæcum itself; *perityphlitis*, inflammation of the peritonæum covering the cæcum; *paratyphlitis*, inflammation of the connective tissue behind the cæcum, or, more correctly, as the cæcum is usually covered by a serous membrane, of the connective tissue in the neighborhood of this part of the bowel. The use of the last two terms should be altogether discarded, as the cases are, with rare exceptions, due to disease of the appendix vermiformis, and not to affections of the cæcum.

We have in the cæcal region the following affections:

Typhlitis, inflammation of the cæcum proper—a doubtful and uncertain malady, the pathology of which is unknown, but which clinically is still recognized by authorities. A majority of the cases are unquestionably due to appendix disease.

Appendicitis: (1) Catarrhal; (2) ulcerative; (3) perforative, with the production of abscesses, which may be pericæcal, pelvic, intra-peritoneal, perinephritic, or lumbar, depending on the situation of the vermiform process.

TYPHLITIS.

At present inflammation of any sort, accompanied by pain in the right iliac fossa, is generally thought to be due to disease of the appendix; and, so far as post-mortem statistics indicate, an immense majority of all these cases are due to this cause. Clinically, however, authors still recognize typhlitis (inflammation of the cæcum), associated with lodgment of fæces (*typhlitis stercoralis*) The cases are met with in young persons, in boys more commonly than in girls; the subjects have usually been constipated, or there have been errors in diet. The patient complains of pain in the right iliac fossa; there are constipation, nausea, sometimes vomiting; fever, if present, is usually slight, rarely rising above 101°. There is fulness in the right iliac fossa, the decubitus is dorsal, and the right thigh may be flexed. On pressure there is tenderness, and in many instances a doughy, sausage-shaped tumor in the right flank. The attack lasts for from three days to a week, the pain gradually subsides, the tumor mass disappears, and recovery is complete.

The anatomical condition is unknown, and it is by no means certain that these cases are in reality cæcal. Many are probably due to dis-

ease of the appendix, and even when the sausage-shaped, doughy tumor, regarded as diagnostic of typhlitis stercoralis, is present, the cæcitis and fæcal retention may be secondary. The cases do well; a great majority of them terminate favorably, a point which, as Pepper remarks, is opposed to the belief that they are all dependent upon appendix disease.

In the *treatment* of this condition an ice-bag should be placed over the cæcal region, large enemata given once or twice a day to empty the colon, and opium given to allay the pain.

More serious disease of the cæcum does occasionally occur, and there are a few instances in which an ulcer perforates. The rarity of this, however, is shown by the fact that Fitz was only able to collect three cases. Two instances have come under my observation in which perforation of an ulcer in the cæcum led to extensive pericæcal abscess.

APPENDICITIS.

The appendix vermiformis is extremely variable in position. It commonly lies behind the ileum with the tip pointing toward the spleen. It is frequently turned up behind the cæcum or it lies upon the psoas muscle with its tip at the margin of the pelvis. It has, however, been found in almost every region of the abdomen. Thus in my post-mortem notes it is stated to have been found in close contact with the bladder; adherent to the ovary or broad ligament; in the central portion of the abdomen, close to the navel; in contact with the gall-bladder; passing out at right angles and adherent to the sigmoid flexure to the left of the middle line of the abdomen; and in one case it passed with the cæcum into the inguinal canal, curved upon itself, re-entered the abdomen, and was adherent to the wall of an abscess cavity just to the right of the promontory of the sacrum. Foreign bodies rarely lodge in it. Only two instances have come under my notice; in one there were eight snipe shot and in the other five apple pips. On the other hand, oval bodies resembling date stones are very common. They consist of inspissated mucus and fæces, in which in time lime salts are deposited, forming enteroliths.

Post-mortem examinations show that the appendix is very frequently the seat of extensive disease, past or present, without the history of any definite symptoms pointing to trouble in the cæcal region. Among the commonest of these conditions is obliteration, either total or partial. When at the cæcal end, the appendix may be enormously dilated, forming a tumor the size of the thumb or as large as a sausage. In the cases of obliteration the appendix may be free, more commonly it is adherent, and there may be about it signs of old inflammation or even a small encapsulated abscess, which has given no trouble.

Etiology.—Appendicitis is a disease of young persons. According to Fitz's statistics, more than fifty per cent of the cases occur before the twentieth year; sixty per cent between the sixteenth and thirtieth years

(Einhorn). It has been met with as early as the seventh week, but it is rarely seen prior to the third year. It is very much more common in males than in females—eighty per cent, according to the tables of Fitz, but in his personal experience in 72 cases males were only twice as frequently affected as females. Contrary to the general experience, the Munich figures (Einhorn) indicate a relatively greater number of women attacked. The fæcal concretions and foreign bodies already referred to probably play the most important *rôle* in the etiology of the disease. In a series of 152 cases the fæcal masses were present in forty-seven per cent and foreign bodies in twelve per cent. Matterstock, in 169 cases of perforative appendicitis, found the percentage to be fifty-three and twelve, respectively. Typhoid fever and tuberculosis frequently induce ulceration of the appendix, but not often perforation. Fitz suggests that some of the cases of peritonitis which recover in typhoid fever are due to perforation of the appendix. Traumatism plays a very definite *rôle*, and in a number of cases the symptoms have followed the lifting of a heavy weight, or a fall or a blow. Constipation, overloading the stomach with indigestible food, indiscretions in diet, are mentioned in many cases. The tendency of the disease to recur is remarkable. Among 257 cases (Fitz) eleven per cent had had previous attacks. In the recurring appendicitis no factor is of greater importance than overeating, and attacks may follow directly upon the taking of large quantities of unsuitable food.

Morbid Anatomy.—For practical purposes we recognize a catarrhal and an ulcerative appendicitis. In *catarrhal appendicitis* the entire tube is thickened, the peritoneal surface may be slightly injected, and adhesions may have formed, so that there is a slight circumscribed peritonitis. The lumen may be much contracted, particularly toward the cæcal end; the mucosa is thickened, covered with a tenacious mucus; and very commonly fæcal concretions or small enteroliths are present. The coats are thickened throughout, particularly the muscularis, and the entire tube is firm and stiff. It may attain the size of the index finger or even that of the thumb. When laid open longitudinally, it at once assumes a rolled form in the reverse direction.

Ulceration and Perforation of Appendix.—Many cases of ulcer present no symptoms. In typhoid fever and phthisis eleven instances have come under my observation in which there were no clinical indications of the lesion. The dangerous ulcers follow the irritation of the fæcal concretions or foreign bodies. It may result also from obliteration of the cæcal end and distention of the lumen with fluid. The perforation may have the following direct effects: (*a*) The appendix may hang free in the peritoneal cavity, adhesions not having formed, when the perforation at once excites a diffuse and violent suppurative peritonitis.

(*b*) More commonly, in fact, almost as a rule, the ulcerated appendix becomes adherent and a localized peritonitis results. Perforation then occurs, with the formation of a circumscribed intraperitoneal abscess

cavity, which may be small and which varies in situation with the appendix. Perhaps the most common situation is on the psoas muscle, in the neighborhood of the terminal portion of the ileum. In cases of this sort I have most frequently found the small localized abscess just at the angle between the ileum and the cæcum. It may, however, be within the pelvis or close to the sacrum. Adhesive peritonitis, perforation, and the formation of a localized abscess may go on without the production of serious symptoms, and the condition may be found when death has resulted from accident or some intercurrent affection. In some cases a large circumscribed fæcal abscess forms in the iliac region and points midway between the navel and the anterior superior spine of the ilium.

Unfortunately, in many cases the localized abscess cavity excites the most intense peritonitis. Often without actual rupture diffuse suppurative disease occurs. In many instances the first indication of serious trouble is the acute, agonizing pain which follows the diffusion of this localized peritoneal process. The contents of the limited abscess may not be more than a few cubic centimetres, are usually darkish gray in color, and excessively offensive.

(*c*) When the appendix passes behind the cæcum and colon and is not within the peritonæum, perforation at once produces a retroperitoneal abscess, which may terminate in many different ways; thus the pus may pass beneath the iliacus fascia and appear at Poupart's ligament, in which situation external perforation may occur and recovery take place. The pus may be chiefly in the retroperitoneal tissue in the flank, forming a large perinephritic abscess. In a case under the care of Gardner, of Montreal, an enormous abscess cavity developed in this situation, which contained air, pushed up the diaphragm nearly to the second rib, and produced the symptoms of pneumothorax. Perforation of the pleura may occur in these cases, forming a fæcal pleural fistula. The pus may extend along the psoas muscle and may perforate the hip joint, or pass to the neighborhood of the rectum, or produce multiple abscesses of the scrotum, or, passing through the obturator foramen, form a large gluteal abscess. Perforation into the bladder may occur, but is not nearly so common as perforation into the bowel. In both instances recovery may follow, though there is greater danger in perforation into the latter. The appendix has been discharged *per anum*.

The remote effects of perforative appendicitis are interesting. Hæmorrhage may occur. In one of my cases the appendix was adherent to the promontory of the sacrum, and the abscess cavity had perforated in two places into the ileum. Death resulted from profuse hæmorrhage. Cases are on record in which the internal iliac artery or the deep circumflex iliac artery has been opened. Suppurative pylephlebitis may result from inflammation of the mesenteric veins near the perforated appendix. Two instances of it have come under my notice; in one there was a small localized abscess which had resulted from the perforation of a typhoid ulcer

of the appendix. In the other case, which I saw with Machell, of Toronto, the symptoms were those of septicæmia and suppuration of the liver. The abscess of the appendix was small and had not produced symptoms. In the healing of extensive inflammation about the margin of the pelvis the iliac veins may be greatly compressed, and one of my patients had for months œdema of the right leg, which is still enlarged.

Symptoms.—As already mentioned, a simple catarrhal appendicitis may lead to a fatal result, and, on the other hand, perforation and abscess formation may take place without exciting serious symptoms. No classification into light, medium, and severe forms can be made, as the most severe of all features of the disease—general peritonitis—may be the very first indication of the existence of any trouble.

Catarrhal inflammation may induce the most characteristic features of appendix disease. The facts on which this statement is made are conclusive. A man aged twenty-eight was admitted to the Johns Hopkins Hospital with pains in the abdomen, localized in the right iliac fossa, which in July became severe enough to confine him to bed for several weeks. In August the attack returned with severity. No tumor was to be felt externally, but on rectal examination a firm, rounded body could be felt high up on the right margin of the pelvis. Laparotomy was performed and the appendix found in the true pelvis, slightly adherent, very much thickened, but without perforation or ulceration. Bridge reports an instance in which a woman aged twenty-eight had an attack of severe abdominal pain, vomiting, constipation, but no tumor. The temperature rose as high as 101°, the thighs were flexed, and there was pain on extension of the psoas. Temporary improvement followed and then a recurrence, accompanied with rise of temperature and return of the pain. Laparotomy was performed and a thickened, dense appendix found, which contained three small enteroliths. In both these instances persistent, severe symptoms were caused by what must be termed a chronic inflammation of the appendix, without ulceration and without perforation. Both cases recovered. A similar instance has occurred at the Pennsylvania Hospital, under the care of Thomas G. Morton. A suppurative peritonitis may also occur without perforation or ulceration. In a case reported by Fitz there had been previous attacks, from which recovery by resolution had taken place; then an abscess at the brim of the pelvis was opened and drained. After recovery again a recurrence occurred, and finally the appendix was removed and found to be thickened, but neither ulcerated nor perforated, and only adherent in a limited extent to the omentum.

In *perforative appendicitis* there may be initial symptoms, such as nausea, constipation, sometimes diarrhœa, and a sense of uneasiness and distress in the right iliac fossa. These may possibly be associated with the localized peritonitis. A sudden violent pain in the abdomen, most commonly in the right iliac fossa, is the "most constant, first decided symp-