

CHAPTER IX

THE ABDOMEN

THE abdomen contains a large number of very important organs and structures, but just as their physiology and pathology are in some instances obscure, so also are the means at our disposal for their thorough clinical investigation imperfect. It is in this region that we have to deal with symptoms which on the one hand may be of trivial order, or on the other of extreme gravity; symptoms and conditions the issue of which will largely depend on the promptitude, knowledge, and skill of the medical practitioner and upon his adequate comprehension of their true meaning.¹

PART A. SYMPTOMATOLOGY

§ 238. **Local Symptoms.**—The symptoms referable to disease situated within the abdomen are necessarily of the widest and most varied kind, but there are only three which are sufficiently constant to be regarded as cardinal symptoms, all of which are referable to the abdomen itself—viz., ABDOMINAL PAIN, GENERALISED ENLARGEMENT, and LOCALISED TUMOUR.

VOMITING is a fairly constant accompaniment of all acute abdominal conditions, whether the stomach is involved in the lesion or not. Its causes are discussed in § 271.

The presence of DIARRHŒA and CONSTIPATION depends very largely on whether the intestinal canal is affected, and these are fully dealt with in Chapter XI. The other symptoms also depend largely upon which of the abdominal organs is affected, with one important exception—viz., “INDIGESTION.” In all chronic abdominal disorders, no matter which organ is affected, we are often consulted for “INDIGESTION”; in fact, nausea and all the other symptoms of pronounced dyspepsia may be due to disease quite unconnected with the stomach, and located, for instance, within the uterus, appendix, gall-bladder, colon, kidneys, prostate, liver, lungs, pancreas or other organs.

ABDOMINAL PAIN, if acute and sudden, is a medical emergency of the most important kind; if chronic, it presents many difficult questions for diagnosis. It therefore merits the most careful study and analysis (§ 242). The diseases *outside the abdomen* which may cause it are:

1. *Diaphragmatic pleurisy*, or a basal pleuro-pneumonia, may give rise to acute abdominal pain of sudden onset (often referred to the correspond-

¹ Although in one particular patient there is usually only one pathological process at work, it must not be overlooked that a patient with *tabes dorsalis* may also be suffering from a perforated peptic ulcer, or that a patient with pneumonia does occasionally develop acute appendicitis at the same time.

ing iliac region), and to abdominal rigidity and other symptoms of acute peritonitis, which can only be differentiated by the pulse-respiration ratio and the concurrent symptoms.

2. *Root pains* from the spinal nerves may be referred to the abdomen. In this way spinal caries (especially in children), a spinal tumour, or the crises of locomotor ataxy may be mistaken for various abdominal diseases.

3. An *abscess* in the abdominal wall, a bruise, or a ruptured muscle may be similarly mistaken, but these should present no difficulty. *Fibrositis* of the abdominal wall has led to mistaken diagnoses of appendicitis and ovaritis, or of the diaphragm to confusion with an upper abdominal lesion.

4. *Diabetic coma* is occasionally heralded by pain simulating appendicitis.

5. *Paroxysmal tachycardia*, *pericarditis* and *coronary thrombosis* have been mistaken for a condition requiring laparotomy.

ABDOMINAL ENLARGEMENT and ABDOMINAL TUMOUR are considered in Part C.

The **General or Remote Symptoms** met with in abdominal disorders are, as just mentioned, of an extremely varied nature, and our endeavour should be to associate correctly these symptoms with the abdominal organ which is affected.

§ 239. **Shock** (or **Collapse**) is a frequent general symptom in acute abdominal disease; it is a condition of extreme prostration. Shock and collapse are clinically identical. There is paresis of all the muscles, voluntary and involuntary (muscles of the limbs, of respiration, of the heart and arteries), and a rapid fall in blood pressure. The *Symptoms* may be arranged under the following headings: (1) The skin (especially of the extremities) is pale, cold, and clammy; the surface temperature is 2° F. or more under normal; the pupils are dilated, and react slowly to light. (2) The circulation and respiration are feeble, the pulse being rapid, of low volume and often scarcely perceptible. (3) The temperature is sub-normal. (4) Restlessness, air hunger and marked pallor are present in shock accompanied by profuse hæmorrhage. (5) There is apathy, but the intellect is clear. The urine and other secretions are diminished or suppressed. The patient may die, or may pass into a reaction stage, with slight pyrexia and sometimes vomiting.

Diagnosis.—In *coma* the mind is completely obscured, and the respiration laboured and stertorous. Save for the vital functions, all is in abeyance. (See § 711 *et seq.*) In *syncope* consciousness is generally lost, but the condition is transient.

The *Causes* of shock may be divided into those of sudden and those of gradual onset. The depth of shock varies with the causative lesion.

Surgical shock is frequently divided into primary and secondary stages: the former comes on rapidly and is believed to be due to afferent nervous impulses acting on the brain, producing paresis of the vaso-motor centre and dilatation especially in the splanchnic vessels. Secondary shock is much more insidious and more dangerous: it is the result of loss of blood plasma through the capillary walls, often in association

with pooling stagnant blood in a dilated capillary bed : later it is followed by absorption of toxic products from the site of injury.

(a) OF SUDDEN ONSET (often due to primary shock). These may be subdivided into : (1) Those due to *external injury*. (i.) Traumatic shock such as gunshot wounds and accidents. The amount of shock varies, especially with the extent of hæmorrhage, and to a less extent with the amount of injury. (ii.) Fractures of long bones produce an amount of shock out of proportion to the apparent injury. (iii.) Severe burns, especially on the trunk. (iv.) Head injuries with concussion. (v.) From electrical currents. (vi.) Certain narcotic poisons (hydrocyanic acid, carbon monoxide § 561). (2) Those due to *internal causes*. (i.) Profuse internal hæmorrhage as with hæmatemesis, ruptured ectopic gestation. (ii.) Perforation of an abdominal viscus with extravasation of its contents into the peritoneum. (iii.) Rupture or torsion of an abdominal organ. (iv.) Very severe acute pain, as with renal or biliary colic. (v.) Sudden intestinal obstruction. (vi.) Pulmonary or other embolism. (vii.) A large spontaneous pneumothorax. (viii.) Coronary thrombosis. (ix.) Cerebral hæmorrhage. (x.) With acute pancreatitis or acute suprarenal hæmorrhage (§ 244).

(b) OF GRADUAL ONSET : (i.) Peritonitis and other abdominal inflammations. (ii.) Delayed hæmorrhage from trauma on the 7th–10th day, *e.g.*, from a ruptured liver, spleen or kidney, and following sudden movement or even an enema. (iii.) Profuse diarrhœa and vomiting. (iv.) Sudden and severe emotion (terror, grief, etc.). (v.) Privation and exposure to extremes of heat and cold. (vi.) Sea and air sickness. (vii.) Blast and crush injuries associated with renal failure. Other *toxic causes* include (viii.) Post-anæsthetic and post-operative shock. (ix.) An overdose of hypnotic and anæsthetic drugs. (x.) Poisoning by irritants (oxalic acid, arsenic, phosphorus). (xi.) Food poisoning. (xii.) Anaphylaxis (§§ 521, 609). (xiii.) The asthenic types of fever such as may attend typhoid and yellow fever. (xiv.) The termination of many diseases described in the chapter on debility.

Diagnosis.—When a patient is found in a state of collapse or shock, the physician has to diagnose the *cause* of the condition. After applying restoratives he should inquire : first, whether there is a history of injury, hæmorrhage, or emotional disturbance, etc. ; secondly, if the patient was in good health up to the time of onset of the condition, so as to exclude group (b) ; thirdly, what food the patient has recently taken, remembering the possibility of poison. Finally, he should examine all the viscera, especially the heart and abdominal organs, beginning at the part which is or has been the seat of pain.

Etiology.—The main factors producing shock vary from case to case, and with the cause. The most important are : (i.) hæmorrhage : (ii.) circulatory failure : (iii.) severe pain : (iv.) prolonged exposure : (v.) dehydration : (vi.) the mental reactions of the patient, including loss of consciousness : (vii.) the absorption of toxic products.

The immediate *Treatment* consists in dealing with the cause : *e.g.*, blood loss must be stopped, an injured or fractured limb immobilised. When pain is severe this should be combined with an injection of morphine, and by the application of warmth with hot-water bottles and warm blankets, or by an electric cradle. The head should be lowered, the feet raised and even the legs bandaged following severe hæmorrhage. In mild cases, and if there is no abdominal injury, brandy may be given by mouth. Stimulants such as injections of nikethamide (coramine) 1–2 c.c., leptazol (cardiazol) $\frac{1}{2}$ –1 c.c., and adrenalin may be repeated. In severe cases isotonic blood serum or blood plasma should be given in large quantities ($\frac{1}{2}$ –2 litres) intravenously. When blood loss has been marked, transfusion of whole blood ($\frac{1}{2}$ –2 litres or more) is essential. In hot climates, and in the presence of dehydration, these may be supplemented by isotonic gum-saline or dextrose (5·0 per cent.) intravenously, or normal saline or isotonic glucose per rectum. Only after recovery from primary shock, and when the fall of blood pressure has been corrected, should the patient be operated on.

SHOCK (COLLAPSE) AND PULSE-TEMPERATURE RATIO.—In connection with the general symptoms of abdominal diseases, two facts need special mention—(1) Profound primary shock is common at the onset of acute abdominal conditions. A subnormal temperature is one of the symptoms of shock, and for this reason it is often present in the early stage of abdominal trouble, and it rarely ranges very high even in the gravest abdominal conditions. In acute peritonitis, for instance, an extensive inflammatory process affects the peritoneum, which acting alone might produce a temperature of 105° F. or more, but by reason of the secondary shock it is rarely more than 102° or 103° F. (2) *In the pulse, however, we find our best guide to the severity of mischief within the abdomen.* In all acute diseases, other than abdominal, we find a rough general proportion between the height of the temperature and the rate of the pulse. Thus, a temperature of 100° F. will correspond roughly with a pulse of 100, 101° with 110, 102° with 120, 103° with 130, and so on—an increase of about 10 for every 1° F. But in acute abdominal conditions this is not so. The pulse-temperature ratio is disturbed, for although the pulse rate increases with the severity of the abdominal condition, the temperature never increases proportionately. Indeed, in many of the worst cases, the temperature is one or more degrees below normal. The pulse, however, is usually a good guide, and one may say (1) that if the pulse remains under 100 nothing very serious is happening within the abdomen; and (2) that the rate of the pulse and the pulse-temperature ratio are great aids to the diagnosis, and in some sense measures, of acute abdominal disorder, especially when that disorder has reference to the peritoneum. In assessing a patient's reaction due regard must be paid also to the effects of anxiety on the pulse rate.

PART B. PHYSICAL EXAMINATION

§ 240. In the examination of the abdomen we must proceed systematically, as in the examination of the thorax, by INSPECTION, PALPATION, PERCUSSION, MENSURATION, and occasionally auscultation; though of all these measures palpation by the educated hand is at the present time the most valuable means we have. X-RAYS assist in certain cases.

1. CAREFUL INSPECTION OF THE ABDOMEN should on no account be omitted; much can be learned in this way. The best point of view is that from the foot of the bed, or by bending over the patient's feet, so as to view the abdomen from below. The mere fact of *enlargement* may thus be verified, and whether the enlargement be generalised and uniform, or whether it be localised or asymmetrical. Notice whether the umbilicus is centrally situated, and also whether the surface presents dilated veins, such as occur in abdominal cancer, or when the portal vein or inferior vena cava is obstructed. Dilatation of the abdominal veins is met with chiefly in three conditions: (1) In liver cirrhosis, these veins being part of the collateral circulation which gradually becomes established (§ 260); (2) the veins, without being much dilated or prominent, are unduly apparent in cases of abdominal carcinoma. It is a sign of considerable value and constancy. (3) Extreme dilatation and varicosity of the superficial veins occur only when the inferior vena cava is obstructed. This is generally due to a gummatous deposit in or around the posterior border of the liver where the vena cava passes through it. The veins of the legs and testes generally share to a less extent in the dilatation. Notice also whether there is any fistula, thickening or infiltration round the umbilicus such as may occur in cancer and tuberculous peritonitis. An abdominal enlargement due to the presence of air or gas is rounded anteriorly, but when due to fluid it is usually flattened in front and the flanks bulge; when there is obstruction of the large intestine the flanks bulge; whereas in obstruction of the small intestine low down the swelling occupies the centre of the abdomen. Incidentally you may notice the presence or absence of the white lines (*lineæ albicantes*) left by a previous pregnancy, and of scars left by a previous operation. The presence of a hernia or of tumours of the wall (increased by coughing) may be recognised. The amount of *movement* of the abdominal wall with inspiration should be noticed, for diminished or absent movement constitutes an important sign of general peritonitis. With local peritonitis, the abdominal wall over that area may not move, whilst elsewhere abdominal respiratory movement is normal. Pulsation seen in the epigastrium is often normal, but may be due to the right ventricle or an engorged liver secondary to heart failure. Sometimes aortic pulsation is unduly visible, especially in thin neurotic dyspeptic women, or it may be transmitted by a pyloric tumour lying over the aorta. Rarely the pulsation is due to an abdominal aneurysm. *Visible peristalsis* should be looked for and should be provoked by gently flicking the abdomen or, in the case of a child, giving a feed; if present, its position and direction should be noted.

The REGIONAL ANATOMY OF THE ABDOMEN is important as a guide to the seat of disease (Fig. 67).

2. PALPATION.—With practice, experience, and a knowledge of anatomy a great deal can be learned by careful palpation. The hand should be warm, otherwise the patient may flinch. Palpation may be (*a*) superficial and (*b*) deep. Superficial palpation should be carried out first; test for hyperæsthesia by picking up a fold of the skin and subcutaneous tissue from each of the four quadrants in turn. If hyperæsthesia is present the patient may complain of soreness, or show pain by his expression. Hyperæsthesia of the underlying segments of the abdominal wall is revealed by repeatedly stroking the overlying skin; where it is present the reflex is brisker and is maintained for a longer time than on the normal side. For deep palpation the hand should always be laid *flat* on the abdominal wall; then by gently dipping the fingers, by flexing the metacarpo-phalangeal joints, we ascertain (1) the presence of any tumour; (2) the boundaries of some of the solid organs. Bimanual palpation should be employed in feeling the kidneys, spleen, and pelvic organs. The patient should lie on his back with the knees drawn up and the head and shoulders supported, so as to relax the abdominal muscles. Do not use the tips, but only the pads of the fingers, for the tips stimulate the recti muscles to contract, and thus to simulate a tumour where none exists. Many patients offer considerable involuntary resistance; this must be overcome by placing them in an easy posture with the knees flexed, and distracting their attention, or asking them “to let the breath go” or to breathe deeply and regularly. Relaxation is obtained in others by an anæsthetic such as gas and oxygen or soluble hexobarbitone B.P. (evipan) in adults, and ethyl chloride in children. Much obesity is another obstacle to palpation. Palpation reveals the presence of localised resistance and tenderness which denote underlying inflammation, but it must be remembered that in severe toxæmia this reflex rigidity may be very slight. Tumours and flatulence are detected by palpation; the movement of fluid within the abdomen conveys a thrill (§ 259). The palpation and percussion boundaries of the different organs are described in later chapters.

3. PERCUSSION of the abdomen is carried out with the same precautions as in the case of heart and lungs, and the student will now find it convenient to be able to percuss with either hand. The liver and spleen give a dull note on percussion. The full bladder or an ovarian cyst is dull with a horseshoe-shaped area of resonance above it. By this means we ascertain the presence of solid and fluid, which are dull, or of gas, which is resonant. When the fluid is free the dullness alters with the position of the patient and gives a percussion wave or thrill.

4. By MEASUREMENT we ascertain the amount of increase or decrease in size. As a general rule, horizontal measurement should be taken at the level of the umbilicus, and it should be recorded for future reference. In order to ascertain whether the enlargement is symmetrical, we measure from the umbilicus to the ensiform cartilage above and the pubis below,

and from the umbilicus to the anterior spine on each side. These four measurements should be approximately equal. From these data we ascertain slight deviations from symmetry.

5. AUSCULTATION and AUSCULTO-PERCUSSION are useful in certain cases: one can thus hear peristaltic movements or gas gurgling through

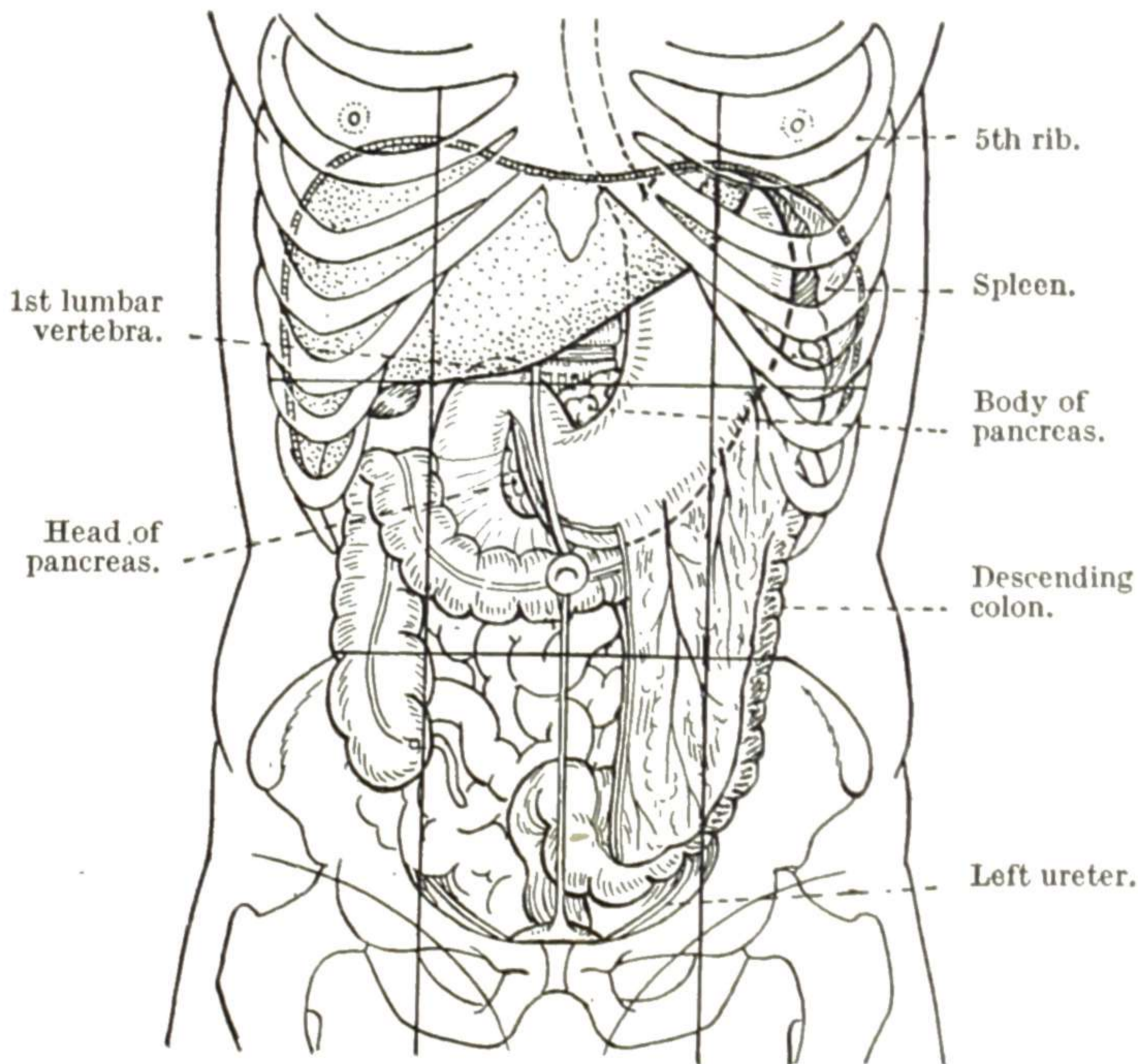


FIG. 67.—REGIONS OF THE ABDOMEN.

For purposes of convenience the abdomen is divided into nine regions. These are bounded by (a) two imaginary lateral vertical lines running upwards from the mid-point between the symphysis pubis and the anterior superior iliac spine below, to the ribs above; and (b) two imaginary horizontal lines. The upper lies mid-way between the symphysis pubis and the suprasternal notch (transpyloric plane running through the first lumbar vertebra and usually coinciding with the tips of the ninth costal cartilages): the lower crosses at the level of the iliac crests.

Their names and the organs they contain are as follows:

<p><i>Right Hypochondriac.</i> The right lobe of the liver and the gall-bladder, upper part of the right kidney, and the right suprarenal.</p>	<p><i>Epigastric Region.</i> The left lobe and lobulus Spigelii of the liver.</p>	<p><i>Left Hypochondriac.</i> Part of the fundus and body of the stomach, the spleen and tail of the pancreas, the splenic flexure of the colon, upper half of the left kidney and the left suprarenal.</p>
<p><i>Right Lumbar.</i> The ascending and proximal part of the transverse colon, lower part of the right kidney, and some convolutions of the small intestine.</p>	<p><i>Umbilical Region.</i> The middle and pyloric end of the stomach, the first, second and proximal portion of the third part of the duodenum, the head and body of the pancreas, the middle of the transverse colon, part of the great omentum and mesentery, and some convolutions of the jejunum and ileum.</p>	<p><i>Left Lumbar.</i> Descending colon, part of the omentum, lower part of the left kidney, and some convolutions of the small intestines.</p>
<p><i>Right Iliac.</i> The caecum, ovary and ureter.</p>	<p><i>Hypogastric Region.</i> Convolutions of the small intestines and the bladder in children and in adults when distended, the appendix, the pelvic colon, and the uterus during pregnancy.</p>	<p><i>Left Iliac.</i> Sigmoid flexure of the colon ureter and ovary.</p>

a sphincter (*e.g.*, at the cardia or the ileo-cæcal valve); and can delimit the boundaries of an organ. Friction may be heard over liver or spleen in some cases of peritonitis and with embolism of the spleen.

6. A RECTAL EXAMINATION should always be made.

7. EXAMINATION with X-rays (with a barium meal or enema, or by cholecystography or pyelography): or the skilled use of a sigmoidoscope, cystoscope, gastroscope and œsophagoscope may assist in obscure and in chronic cases.

The FALLACIES of abdominal enlargement are: (1) *Fat in the omentum*. (2) *Phantom tumour*. See § 262. (3) *Pendulous abdomen*, so frequent in elderly women, is often thought by the patient to be a "tumour," but is due to weakness of the muscles. (4) In *rachitic children* the liver and spleen may be pushed down by the deformed costal arches, and so produce the appearance of an enlarged abdomen. (5) Extreme lordosis (and see § 262).

PART C. ABDOMINAL DISORDERS: THEIR DIAGNOSIS,
PROGNOSIS, AND TREATMENT

§ 241. **Routine Procedure and Classification.**—Having *first* ascertained that the patient's leading symptom is one of those above referred to (§ 238), we *secondly* inquire into the history, and especially whether the condition came on acutely and suddenly, or is chronic and long-standing. The procedure to be adopted in acute cases, and in chronic cases, is given under their respective headings. *Thirdly*, proceed to the physical examination of the abdomen, the routine method in ordinary cases consisting of (1) Inspection; (2) Palpation; (3) Percussion; and (4) Mensuration. In any doubtful case the rectum, vagina, hernial orifices, urine, and fæces must be examined. The fallacies mentioned in § 240 must be borne in mind.

If **severe abdominal pain**, which came on **suddenly** and acutely, be the leading symptom, first turn to § 242.

If **abdominal pain** of some duration and running a **chronic** course be the leading symptom, turn to § 249.

If there be a **generalised abdominal enlargement**, turn to § 257.

If there be **localised tumour**, turn to § 263.

§ 242. **Acute Abdominal Pain**, coming on **suddenly**, or supervening on chronic abdominal pain, includes amongst its causes some of the most serious conditions with which a physician or surgeon can have to deal.

The *causes* of abdominal pain may be conveniently classified thus:

A. ABDOMINAL PAIN coming on **suddenly, with shock**.

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|-----------------------------------------------------------------------------------------------------------------------------------|-------------|
| I. Perforation of some organ or cyst (perforative peritonitis) | §§ 243, 244 |
| II. Internal hæmorrhage | § 244a. |
| III. Acute intestinal obstruction (strangulated hernia, intussusception,
internal strangulation, volvulus and paralytic ileus) | §§ 244, 319 |
| IV. Torsion of ovarian cyst; V. embolism of the mesenteric
artery; VI. acute pancreatitis | § 245 |

B. ABDOMINAL PAIN coming on **suddenly, without shock.**

VII. Colic (Intestinal, renal, biliary, appendicular), and pyloric spasm	§ 246
VIII. Appendicitis (some cases)	§ 247
IX. Pancreatic calculus; floating kidney; splenic embolism; and some other obscure organic affections	§ 248
X. Root or referred pain	§ 248

In the first six the acute abdominal pain is usually ATTENDED BY SHOCK, but not in the last four. This, however, is only relative, and in any doubtful case the whole should be passed in review.

In order to ascertain which of these causes is in operation, and in view of the gravity of some of these cases, it will be desirable to consider the METHOD OF PROCEDURE in some detail.

1. Regarding the *cardinal* or *leading* symptoms, inquire carefully, as in all cases of "pain," concerning its position, character, duration and intensity. The position of the pain is not always a guide to the organ affected, for it rapidly tends to become generalised; but the direction in which it is referred is of great help in the diagnosis of the four kinds of colic. Moreover, local disease may be accompanied by generalised pain (which may later settle down locally), and widespread disease may give rise to a localised pain. Inquire about the mode of onset of the pain, its severity, its duration, its recurrence, its radiation, what relieves or aggravates it; also what other features are usually associated with it. Whenever the three symptoms, ABDOMINAL PAIN, VOMITING, and SHOCK, come on together suddenly, the condition is very probably due to PERFORATION (which will later be accompanied by PERITONITIS), INTERNAL HÆMORRHAGE or INTESTINAL OBSTRUCTION.

2. As to the *History of the Illness*, it is useful to note if there had been any illness or operation previous to the onset of the pain pointing to ulceration, dyspepsia, or other derangement of the abdominal organs. The occupation may shed some light on the cause—*e.g.*, sudden strain, working with lead. The description of the mode of onset may assist—*e.g.*, "something was felt to give way," and it should especially be noted whether the pain was acute at its onset or whether it worked up to a climax later.

3. In the *Examination of the Patient*—(i.) the *age* is an important aid in the diagnosis of the cause of the pain. In childhood there is very probably some intestinal affection, such as enteritis or colic, intussusception, strangulated hernia, or a congenital abnormality; in adolescents and young adults, appendicitis may have to be considered. In adults we think of hernia, ulcer of the stomach and tabetic crises; after middle life and in old age we think of cancer, volvulus or diverticulitis. (ii.) The *sex* may aid us, for in young females we may suspect an ulcer of the stomach even without previous symptoms; and in older women, biliary colic, salpingitis, torsion of an ovarian cyst, the rupture of an ectopic (extra-uterine) pregnancy, frequently overlooked, or gall-stones. (iii.) The presence of *rigidity*, as shown by resistance to palpation, or of *tenderness*, is

of considerable aid; they point to the existence of underlying inflammation. (iv.) *All the organs* of the abdomen must be as carefully and as thoroughly examined as circumstances will permit. Never forget to examine per rectum and vagina, because local tenderness, a pelvic abscess, hæmatoma or tumour may throw considerable light upon the case. (v.) The patient's *general symptoms* must also be carefully investigated. If the temperature *and the pulse* be normal, we may exclude inflammatory conditions. The temperature alone is not a sufficient guide in this respect (see § 239), but in general terms no serious acute abdominal condition exists without the *pulse rate* exceeding 90 or 100. If the patient is much emaciated, in adults we must bear in mind malignant disease, and in children the presence of tubercle. Examine the tongue for dryness and furring: the urine for sugar, crystals, or pus: and do not forget to examine the chest (see § 238).

If the pain, which is severe and has come on suddenly, is **attended by marked shock**, first turn to § 243. If it is **unattended by shock**, turn first to § 246. It must be remembered, however, that any severe pain will cause a certain amount of prostration.

GROUP A. I. *The patient complains of very severe abdominal pain, which has come on suddenly, followed by SHOCK and repeated VOMITING of small amounts. Later, ABDOMINAL DISTENSION develops. The case is one of PERFORATION with PERITONITIS.*

§ 243. **Perforation of the Alimentary Canal, or Rupture of an Abscess, Cyst, or a Solid Organ** (which shortly develops into Perforative Peritonitis). (1) *Ulcers* of the stomach or duodenum are especially liable to perforate. Other ulcers which may perforate are: ulcer of the lower part of the ileum (due to tuberculosis or typhoid fever), ulcer of the cæcum, ulcer of the large intestine, especially the sigmoid (usually cancerous, dysenteric, or syphilitic, or from diverticulitis). (2) *Abscesses* of the appendix (§ 247), liver, gall-bladder, kidney or other organs, or of mesenteric glands. (3) *Cysts which may rupture* are hydatid or simple cysts of the liver, kidney, pancreas, or other organs, ovarian and parovarian cysts. A ruptured bladder produces similar symptoms. (4) *Rupture of an organ* may be followed by internal hæmorrhage (§ 244a) and causes similar symptoms.

The *immediate symptoms* of the perforation in the order of occurrence are (1) very severe sudden abdominal pain, which is the cardinal symptom, accompanied by (2) primary shock, with an ashen pallid face showing a cold clammy sweat; the temperature is subnormal and the pulse of low volume: then (3) vomiting occurs. As the patient recovers from the initial shock the inexperienced physician may be deceived until the *symptoms of general perforative peritonitis* set in; (4) the pain remains severe and becomes generalised; (5) toxæmia produces a condition of secondary shock with rising temperature and pulse rate; (6) vomiting of small quantities becomes incessant. Later the material becomes alkaline to litmus and even fæcal; (7) the eyes become sunken and the tongue furred and dry; (8) there is board-like rigidity of the abdomen and, a

little later, (9) constipation and moderate abdominal distension from paralytic ileus ; (10) the blood shows a marked and progressive leucocytosis.

The commonest causes are acute perforative appendicitis and perforation of a peptic ulcer. This latter may be taken as a type. We should inquire for a history of dyspepsia and other symptoms (§ 287), but in not a few cases rupture has occurred without previous symptoms of any kind whatever. On examination the thighs are flexed, there is tenderness, a board-like rigidity of the muscles, most marked in the epigastrium, and a tympanitic note over the whole abdomen. The disappearance of the liver dulness in the mid-axillary line denotes free gas, and is usually due to ruptured peptic ulcer. After a few hours there is a deceptive *latent period* during which all symptoms of discomfort are diminished. A *stage of reaction* occurs several hours later, when symptoms of secondary shock are found, with acute peritonitis (§ 244), generalised or localised. There is increased abdominal distension, vomiting and tenderness, with decreased rigidity and a rising pulse-rate. In a perforated duodenal ulcer the pain may spread to the right iliac fossa, simulating appendicitis. Three degrees of severity occur with perforation : (a) When there are adhesions the peritonitis may be localised or partial ; (b) when there are no adhesions, but a small leakage, it may be only moderately sudden in its onset ; (c) when the leakage is large it is extremely sudden and severe in its onset. In typhoid fever the symptoms and signs of perforation in the third week may be few (see § 493).

Perforative peritonitis may have to be diagnosed from diaphragmatic pleurisy and basal pneumonia, in which the pulse-respiration ratio is disturbed, but not the pulse-temperature ratio, and from tabetic root pain.

Treatment and Prognosis.—Laparotomy should be performed at once. If the deceptive latent period leads one to believe the patient is recovering, in a few hours general peritonitis will have set in, and operation is indicated, with or without drainage. In cases where patients have been operated upon within the first twelve hours the prognosis is good ; if after twenty-four hours, it is serious. The after-treatment depends on the cause. In the case of rupture consequent on injury internal hæmorrhage may take place with a rapidly fatal result, but even in such cases early laparotomy and blood transfusion should be performed.

§ 244. Acute Peritonitis is an acute inflammation of the peritoneum. It is rarely a primary disease, but its onset is usually sudden, following on perforation.

Symptoms.—(1) The aspect is very characteristic ; the countenance has an anxious pinched look, the cheeks pale, and the skin cold and clammy. The posture of the patient is very characteristic, as he lies on his back with legs drawn up to fix the abdominal muscles. (2) The pain is severe and constant, but liable to exacerbations on account of the intestinal peristalsis and the passage of wind along the bowel.¹ It is

¹ Acute peritonitis, which complicates typhoid fever, is of a latent character, and unaccompanied by pain. This and puerperal peritonitis are the only exceptions.

increased by any movement, even by the respiratory movements; consequently the respiration is thoracic; (3) vomiting is persistent. (4) There is acute tenderness on pressure, so much so that the weight of the bed-clothes can hardly be borne. (5) The abdomen is rigid and immobile. (6) Pyrexia, often ushered in with sudden rigors, and attended by a small, wiry, rapid pulse of 100 to 140 per minute. The temperature is elevated only 2° or 3° F. above normal, and maintained there continuously, unless pyæmia be present, in which case there are rapid variations of wide range. In some cases—*e.g.*, perforation—it may be subnormal at first (*vide supra*). (7) Leucocytosis is found. There is marked prostration, as in all abdominal inflammations, and a great tendency to secondary surgical shock. Even from the beginning there is constipation: hiccough is often present, and if persistent it is a bad sign, as in all abdominal disorders. There is diminution and even suppression of urine. Death occurs from toxæmia, and the mind remains quite clear until the end in uncomplicated cases.

In acute localised peritonitis the symptoms are those of acute general peritonitis, but are less severe, and result in the formation of a localised abscess.

The *Causes* of acute peritonitis may be grouped under seven headings: (i.) *Acute appendicitis* is the most common (§ 247). There may be extension of inflammation from other organs in the abdomen—*e.g.*, diverticulitis, gonorrhœal salpingitis, inflammatory conditions of the intestine (typhoid, dysenteric and actinomycotic), or tuberculosis of other organs.

(ii.) *Perforation of or slow leakage from some part of the alimentary canal*, which had previously become thin by ulceration—simple ulcer of the stomach or duodenum (malignant ulcer rarely perforates because of the infiltration around), typhoid or tuberculous ulcer of the ileum, etc. (see Perforative Peritonitis). Slow leakage from a gastric ulcer may cause a subphrenic abscess or abscess in the lesser sac.

(iii.) *Rupture of an organ or some abdominal cyst*, such as ovarian cyst, or an abscess of the appendix, tube or liver, or rupture of the gall-bladder, etc. (§ 243).

(iv.) *Injury or Operation*.—In cases occurring in women without obvious cause, the possibility of criminal procedure for abortion should always be remembered. As regards surgical operations on the abdomen, modern experience has shown that it is not the actual injury but faulty technique, permitting the introduction of septic organisms, which produces peritonitis.

(v.) *Various Blood Infections*—*e.g.*, pneumococcal (usually in females), streptococcal, staphylococcal, and gonococcal. *Idiopathic Peritonitis* was the name formerly employed when no cause could be discovered. Peritonitis may also complicate scarlatina, dysentery, and the other acute specific fevers. *Puerperal Peritonitis* arises when septic organisms enter through the infected uterine surface. *Bacillus coli communis* may produce peritonitis either as part of a general septicæmia, or primarily.

(vi.) Any condition such as *volvulus* or *intussusception*, in which injury

of the intestinal wall has occurred, may be a cause of peritonitis, local or general.

(vii.) Local peritonitis from *Crohn's disease*.

Acute general peritonitis has to be *Diagnosed* from four diseases: (1) *Acute intestinal obstruction*, in which the constipation is absolute and no flatus is passed, even after repeated enemata; there is usually no pyrexia, and the constitutional disturbance is usually less. (2) In *colic*, although the pain is also very severe, there is an absence of rigidity, and pressure may give relief. Pyrexia and shock are absent, and the pulse is normal. (3) In *catarrhal enteritis* there is pain, and there may be vomiting and tenderness on pressure, but in this disease there is profuse diarrhoea. (4) In certain cases of *hysteria*, acute peritonitis may be very accurately simulated, though the temperature and pulse are normal, there is very little shock and no leucocytosis, and evidences of the hysterical diathesis are present.

The *Prognosis* of general peritonitis is always very serious. As regards etiology, perforative peritonitis, formerly considered the gravest, is probably now the most hopeful if promptly dealt with. Surgery has done much for the rescue of such cases, and undoubtedly the most favourable of them is that due to appendicitis. Patients with this disease, if diagnosed early and properly managed, should hardly ever be lost. The prognosis in any particular case depends therefore on (i.) the time elapsing before operation, (ii.) the cause and the severity of the shock due to toxæmia, and (iii.) adequate drainage.

Treatment.—The treatment of acute peritonitis depends upon whether it is general or local. If *general*, the only rational treatment is by operation, with drainage, immediately a diagnosis has been made. A fatal issue is almost invariable in cases not operated upon, because the condition is rarely primary, and a definite local lesion is usually present. In *local* peritonitis medical treatment is indicated in the early stages, but even then only with the co-operation of a surgical colleague. Medical treatment comprises keeping the patient in bed in the Fowler position and relieving symptoms. The diet should be fluid, consisting of fruit drinks with glucose, soups, jelly, milk, to which stimulants (*e.g.*, brandy) may be added according to the condition of the pulse. Rectal or intravenous feeding with 5% solution of glucose may be necessary. Severe cases with much vomiting are treated by continuous aspiration through a Ryle's tube in the stomach, or a Miller-Abbott tube in the duodenum, fluids being administered solely per rectum and intravenously. Local applications may give relief, especially heat in the form of fomentations. Once a diagnosis has been arrived at, morphia is a most valuable drug, for it relieves the pain, and reduces the peristalsis of the bowel, and so gives local rest. If there is any doubt as to the advisability of a surgical operation, either at once or later, morphia must be withheld, for by masking the symptoms it may lead to a continuation of medical treatment when operation is called for. It is therefore of use chiefly in local peritonitis,

or in general peritonitis where an operation is not permissible. Purgatives may be dangerous, but the lower bowel should be cleared by means of enemata. The hiccough may be relieved by giving ice to suck, by liq. iodi mitis ℥ iii in a little water, by injections of morphia or pethidine, or chloral per rectum (§ 273).

II. *The patient complains of sudden abdominal pain and vomiting, and shows severe shock, pallor, restlessness, air-hunger and subnormal temperature, with rapid running pulse of low volume—the condition is INTERNAL HÆMORRHAGE.*

§ 244a. In **Internal Hæmorrhage** *shock* is the striking feature, and the patient may become very anæmic in a few hours. Pain is not marked, and vomiting, although present at the onset, is not diagnostic. Local tenderness may serve as a guide to the cause of the hæmorrhage. The most important causes are: (1) a ruptured ectopic pregnancy. There may be a history of a missed or abnormal last menstrual period, and on examination a boggy mass is felt in the pouch of Douglas (§ 446). (2) Injuries to the abdominal organs, and especially traumatic rupture of the spleen, liver or kidneys: hæmorrhage may follow immediately after the injury, or may be delayed to the 7th–10th day.

(3) **Acute Hæmorrhagic Pancreatitis** is a special variety of acute pancreatitis (§§ 245, 256), in which auto-digestion leads to extensive internal hæmorrhage.

(4) **Acute hæmorrhage into the suprarenal capsules** produces symptoms similar to those of acute hæmorrhage into the pancreas. There is sudden epigastric and lumbar pain, with vomiting, shock, marked dyspnœa and cyanosis. Death may occur in a few days. Or there may be delirium, convulsions or coma, or extreme muscular weakness for some days before death. It is rarely diagnosed during life. When it occurs as part of a meningococcal septicæmia with purpura, it is known as the Waterhouse-Friderichsen Syndrome. In newly-born infants it occurs as part of a hæmorrhagic diathesis.

Treatment.—Blood transfusion is usually a primary consideration. As soon as possible operation must be undertaken in order to stop the hæmorrhage. With suprarenal hæmorrhage, give injections of vitamin K. and suprarenal cortical extract. In any case of internal hæmorrhage it is important to remember that the primary hæmorrhage may cease from clotting or encapsulation, but recur subsequently from disintegration of blood clot from sepsis.

III. *The patient complains of acute abdominal pain with shock, attended by URGENT AND COPIOUS VOMITING (at first food, then bile, and later, material which is alkaline to litmus, and finally fæcal). There is ABDOMINAL DISTENSION and INABILITY TO PASS FLATUS even after repeated enemata—the condition is ACUTE INTESTINAL OBSTRUCTION.*

Acute Intestinal Obstruction—*i.e.*, obstruction coming on suddenly, is always a matter of serious importance, and every practitioner should be thoroughly acquainted with its several causes. The diagnosis and the various causes are fully dealt with under Intestinal Disorders in § 319.

§ 245. *The patient complains of acute abdominal pain, with more or less*

shock ; *the temperature is probably normal or subnormal, but the symptoms do not quite conform to any of the preceding*—some of the **rarer causes** are probably in operation, such as the following :

IV. **Torsion of an Ovarian Cyst** is known when the signs of such a cyst are associated with the onset of sudden pain and tenderness of the cyst.

V. In **Embolism of the Mesenteric Artery**, a cause of embolism, such as endocarditis, is present. It is rarely diagnosed during life. The absence of symptoms pointing to the other causes, and the presence of melæna, may lead one to suspect embolism. Embolism of the spleen may also cause severe symptoms.

VI. **Acute Pancreatitis** is due to regurgitation of infected bile into the pancreatic duct, due to thickening or spasm of the sphincter of Oddi, and often in association with gallstones. (1) The pain here is very sudden, persistent and severe, usually in the upper part of the left side of the abdomen and extending to the back ; (2) constipation and severe vomiting (never fæcal) are usually present ; and (3) there is usually tympanic abdominal distension with epigastric tenderness and rigidity ; (4) cyanosis, circulatory collapse and profuse sweating, are associated with a subnormal temperature ; (5) a brownish-green discoloration around the umbilicus, or in the lumbar area, when present, aids the diagnosis (§ 256).

GROUP B. VII. *The patient, while apparently in good health, complains of acute abdominal pain, which has come on suddenly, without definite shock ; the pulse does NOT EXCEED 100 ; there may be VOMITING and constipation.* The case is probably one form of COLIC, though APPENDICITIS, ROOT OR REFERRED PAIN, and some OTHER AFFECTIONS may start in this way.

§ 246. **Colic** is a somewhat vague term applied to spasmodic paroxysmal pain situated in the abdomen. There are **intestinal, biliary, renal and appendicular colic**. All have the following features in common : (1) The pain is extremely severe (in the first three, less so in appendicular colic), and sudden in its onset ; (2) not infrequently there is reflex vomiting from the severity of the pain ; (3) the face is pale and “anxious,” and in severe cases the pulse is rapid and feeble, though it practically never exceeds 100 ; (4) *the temperature is neither above nor below normal* ; (5) the physical signs in the abdomen are negative, and the pain may even be relieved by pressure ; (6) the patient is in a “cold sweat,” “doubled up” with pain, restless, or rolling about.

(a) **Intestinal Colic** is due to distension and spasm of the bowel. The colic of the small intestine is characteristically twisting, paroxysmal, and is referred to the epigastrium or umbilicus ; colic of the colon is referred to the hypogastrium. In intestinal colic a hardening of the bowel may be appreciated by the palpating hand. It is relieved by pressure, which distinguishes it from peritonitis. The abdomen may be distended with flatus. Sometimes it is followed or accompanied by diarrhœa and vomiting, as in gastro-enteritis, or by constipation, as in lead colic. Colic may be the first sign of lead-poisoning, accompanied by a slow, hard pulse, with other signs of plumbism, such as a blue line on the gums ; a history of working with lead may be obtainable (§ 553). Colic is a frequent early symptom of *diverticulitis* (§ 321). The *heat cramp* (§ 508) of miners and workers in stokeholds may resemble abdominal colic. Cramp may also be experienced in high or low atmospheric pressures.

(b) **In Biliary Colic**, due to the passage of a gall-stone into the bile ducts, the pain starts in the right hypochondrium: it often radiates round the 9th segment to the angle of either scapula, or reflexly it occurs along the root of the neck or at the tip of the shoulders. A dull pain continues during the intervals between the spasms and may be felt in the right iliac fossa. After lasting a few hours or a day or two it may be followed by jaundice and bile in the urine. A history of previous attacks assists the diagnosis.

(c) **Renal Colic** is due to the movement of a calculus, crystals, mucus, or blood-clot in the pelvis of the kidney or along the ureter. The pain starts in the loin or in the upper lateral abdomen, and radiates *downwards* to the groin and testicle of the same side, which is often retracted. It may last for a day or two. Sometimes pain is referred to the opposite kidney. During the attack there is rigidity in the loin and often some tenderness over the kidney; micturition is frequent; sometimes there is hæmaturia or strangury. For some time after the colic an exaggerated cremasteric reflex persists. There is probably a history of previous attacks, or of gravel, blood or pus in the urine.

(d) **Appendicular Colic** is due to an obstruction in the appendix, by a concretion kink or stenosis from a previous attack; distal to the obstruction acute inflammation may develop. The pain occurs in the right iliac fossa, is never very severe, and is accompanied by some rigidity and localised tenderness over MacBurney's point; in children it may be referred to the epigastric or umbilical regions.

TABLE XIV.—DIAGNOSIS OF COLIC.

	<i>Character and Distribution of Pain.</i>	<i>Associated Symptoms.</i>	<i>Age and Sex of Patient.</i>
Intestinal.	Twisting, around umbilicus, paroxysmal; relieved by pressure.	Constipation (or diarrhœa). No jaundice.	Any age or sex. Sometimes evidence or history of plumbism.
Biliary.	In right hypochondrium, shooting upwards to right or left shoulder, constant, but also in paroxysms.	Jaundice may supervene. Other hepatic symptoms may be present.	Stout married women over forty.
Renal.	In loin shooting down to groin and testicle or labium of same side.	Crystals or other urinary change, pus or hæmaturia. No jaundice. Sometimes frequent micturition or strangury.	Usually male. Children and adults.
Appendicular colic.	In right iliac fossa.	May be vomiting; local tenderness and rigidity.	Any age; both sexes.

Pyloric Spasm, especially with a duodenal ulcer, can give attacks of acute paroxysmal pain in the upper abdomen, and more rarely **Spasm of the Cystic Duct** can cause acute pain arising from the gall bladder.

The *Diagnosis* of the forms of colic is given above. An X-ray examination should be made when more than one attack occurs.

Prognosis.—The course of an attack of colic is short and severe.

Treatment.—For all forms of colic, local applications of hot fomentations, a kaolin poultice, or a hot bath, and hypodermics of morphia (gr. $\frac{1}{8}$ to $\frac{1}{4}$), and atropin (gr. $\frac{1}{60}$), of pethidine (50–100 mgm.) or of ephedrine (gr. $\frac{1}{2}$ –1) may be necessary to alleviate the extreme pain. Large draughts of warm water should be taken. Especially with intestinal colic an enema should be given, followed by suitable purgatives. For lead-poisoning, see § 553. Hepatic colic is dealt with under gall-stone (§ 353) and renal colic in § 408.

VIII. *The Abdominal Pain is constant, but liable to exacerbations, especially after exercise; there is NAUSEA or VOMITING, with some elevation of the temperature; there is RIGIDITY and TENDERNESS in the right iliac region; the pulse is rapid. The disease is probably ACUTE APPENDICITIS.*

§ 247. **Acute Appendicitis** may consist simply of (a) a catarrhal inflammation of the vermiform appendix, which is relatively benign: or (b) a virulent form with ulceration, gangrene and local or diffuse peritonitis.

Symptoms.—In a typical acute attack of appendicitis there are six symptoms which, occurring in this sequence, point to appendicitis—pain, vomiting, tenderness, local rigidity, a quickened pulse, and leucocytosis. (1) The chief symptom is *pain*, coming on acutely, first referred to the umbilicus or epigastrium, and later becoming localised to the right iliac fossa. (2) *Vomiting* may be urgent at the onset of an attack; when it continues for many days the prognosis is unfavourable. (3) On examination, the most marked features are tenderness, rigidity, and later a local swelling. The *tenderness* may be manifest as cutaneous tenderness on picking up the skin in the right iliac fossa between fingers and thumb. There is also deep tenderness on palpation, particularly well marked at “MacBurney’s point,” *i.e.*, at the junction of the outer and middle thirds of a line joining the right anterior superior iliac spine and the umbilicus. A third point of tenderness is often found on rectal examination in the right anterior wall of the rectum, particularly with the pelvic position of the appendix. The *rigidity* causes the abdomen as a whole to show a poor respiratory excursion: on palpation there is guarding of the muscles, particularly of the lower right segment of the rectus abdominis. (4) There may be a local *swelling* or an indefinite tumour with dulness to percussion. These are due to local peritonitis or to abscess formation; they may also be found on rectal examination. (5) The *pulse* is quick and thready and its rate forms the best single indication of the acuteness of an attack. The temperature is rarely above 99° – 100° ; and this disturbance of the pulse-temperature ratio is an important diagnostic aid (§ 89). The disease is rarely ushered in by a rigor. The fever often falls and the pain goes with the onset of gangrene or with spreading peritonitis, but the pulse, except in rare cases, remains rapid. (6) The tongue is almost always coated. Constipation is usually present, so that the case may be mistaken for intestinal obstruction; but sometimes the attack is ushered in with

diarrhœa. The urine is scanty; with pelvic appendicitis the bladder is irritable, and often there is diarrhœa. (7) On listening with a stethoscope no gurgling sounds are heard, owing to spasm of the ileo-cæcal sphincter associated with inflammation around. (8) Leucocytosis of 15,000 to 20,000 per cu. mm. occurs. (9) Paralytic ileus is usually a late event.

Types of Acute Appendicitis.—(i.) *Catarrhal* inflammation is mild and localised to the appendix. It may subside completely, but usually some degree of inflammation remains which causes local discomfort and vague dyspeptic symptoms. (ii.) Recurrent attacks of this nature cause fibrous thickening in the wall and retention of secretion forming a *mucocœle* of the appendix. Then (iii.) a subsequent attack of inflammation produces an abscess in the tip of the appendix. (iv.) *Ulceration and gangrene* of the appendix are due to a more virulent infection, arising behind the obstruction of a stercolith, in a mucocœle, or by obstruction of the lumen by external adhesions. Gangrene is usually due to septic thrombosis of the blood supply to the appendix. (v.) An *abscess* which forms in the lumen may perforate. If the reaction of the peritoneum is vigorous and the organisms not too virulent, a local peritonitis results: the abscess can resolve and the inflammation give a mass of local adhesions. (vi.) In other cases the abscess enlarges and may finally rupture into the bowel or bladder, may descend into the pelvis or point externally above Poupart's ligament (when it is often mistaken for a psoas abscess). (vii.) Sometimes the inflammation extends to the cæcum (typhlitis) or to the surrounding tissues (perityphlitis). (viii.) When the organisms are very virulent, a fulminating general peritonitis is likely to arise.

Aberrant types.—With a retrocæcal appendicitis pain may be referred to the loin, or down the right thigh, in each case leading to flexion of the hip from psoas spasm. If the appendix happens to be a long one with the tip lying in the left side of the pelvis, there may be pain, tenderness and rigidity entirely confined to the left iliac fossa.

Course and Prognosis.—With an acute attack there are three possible events—recovery, local abscess formation, or general peritonitis. (1) In a favourable case the temperature falls about the third day, the swelling disappears, pain and other symptoms subside, and the patient may be well in ten days. In other cases slight fever persists for a few weeks, and there is left an indurated swelling due to the omentum. The patient may go about for months or years with chronic appendicitis, and suffer only vague pains, general malaise and dyspeptic symptoms. At any time, however, the acute symptoms may recur. (2) When the general symptoms show no improvement by the second day, and the local swelling progressively increases, it is probable that an abscess is forming. (3) Perforation, with generalised peritonitis, may occur at any time. The general symptoms in such cases are much more severe, vomiting persists, and the abdomen is distended and motionless by the second or third day. There is no disease in which it is more dangerous to hazard a prognosis. An apparently convalescent case may develop general peritonitis and die

within twenty-four hours; on the other hand, a case presenting every sign of a large and extending abscess may clear up entirely and prove free from any subsequent attack. Apart from the great improvement in the prognosis when immediate operation is performed, the only indications of value when forming an opinion are the condition of the patient as regards shock, collapse, and age. The younger the subject, the more grave the prognosis. In pregnancy, appendicitis is serious. *Complications.*—Apart from local and general peritonitis the complications most to be feared are the formation of a subphrenic, perinephric or pelvic abscess: or implication of the liver by spread along the vessels and lymphatics leading to portal pyæmia. Any previous appendicular inflammation which has not been treated surgically may act as a focal point of infection, causing arthritis, iritis, etc.

Etiology. Two main types of appendicitis are often recognisable. In the first there is obstruction to the lumen of the appendix and the stasis leads to inflammation. In the second there is a blood stream infection of the appendix, often from a catarrhal condition of the naso-pharynx or tonsils.

Treatment.—Rest in bed in the Fowler position and fluid diet are essential. Hot fomentations locally are useful for the pain. Opium in small doses (short of causing drowsiness) is also admissible for the relief of pain after the diagnosis is established. Neither opium nor heroin should be given for long. Other analgesics such as omnopon and pethidine may be employed.

The *question of operation* requires careful consideration, and a surgeon should be early in touch with the case. The largest proportion of recoveries is recorded in cases operated on within six hours of the onset of symptoms which enabled a diagnosis of appendicitis to be made. The subsidence of symptoms is not necessarily a contra-indication to operation. The onset of gangrene, in particular, may cause a sudden subsidence of all signs of acute disorder; even the pulse rate may return to within normal limits, and if seen first at this stage the diagnosis may be very difficult. The most valuable sign, in the absence of clinical indications, is the presence of a leucocytosis. If this goes above 20,000, or is found to be rising when two or more estimations are made at intervals, there is so strong a presumption of pus formation that immediate operation is indicated. If, by this or by other means, the presence of pus is diagnosed, operation must not be delayed. Delay for even a few hours, as, for instance, when the patient or his friends are unwilling that he should be removed to a hospital or home "until the morning," has on many occasions proved fatal from the onset of collapse of such severity that the patient's strength was not sufficient to carry him through even the shortest operation.

§ 248. Among the **rarer causes of acute abdominal pain** without shock are:

IX. Of various **OBSCURE ORGANIC AFFECTIONS** of the abdomen, evidenced at first only by pain, two may be mentioned: **PANCREATIC CALCULUS** and **OBTURATOR HERNIA**, in both of which the only symptom for some time is pain coming on **SUDDENLY** without shock. In the former the pain may be extremely severe, and of a paroxysmal character, situated just below the umbilicus; later on it can be associated with fat in the fæces, emaciation, and glycosuria.

Attacks of KETOSIS in children are associated with pyrexia, headache, abdominal pain and vomiting (§ 384). URÆMIA and PYELITIS can give similar symptoms.

DISLOCATED or FLOATING KIDNEY may be attended by a constant (chronic) pain, or give rise to severe attacks (Dietl's crises, § 253), hardly distinguishable from intestinal or renal colic.

DIVERTICULITIS may cause attacks of acute abdominal pain in the left iliac fossa (§ 321).

INTESTINAL WORMS (§ 316) can cause abdominal pain, pyrexia and constitutional symptoms which must not be confused with acute appendicitis, especially in children.

TORSION OF AN UNDESCENDED TESTIS should be suspected when a testicle is found to be absent from the scrotum.

OSTEOMYELITIS OF THE ILIUM or OF THE SACRAL VERTEBRÆ shows persistent pain, pyrexia and leucocytosis.

In SPLENIC EMBOLISM the pain is generally sudden in onset, but is not usually very severe or lasting, and is referred to the splenic region. Its most common cause is acute or subacute endocarditis, evidences of which are present.

HENOCH'S PURPURA and angio-neurotic œdema may have acute recurring attacks of colic simulating intussusception. For differential features see § 584.

ENLARGED GLANDS may cause symptoms resembling appendicitis. They may be tuberculous, or associated with typhoid or glandular fever, or with streptococcal throats.

In most obscure organic affections the pain comes on gradually, and is of a chronic character. Acute pain occurring in attacks of varying duration is met with in cases of membranous or MUCOUS COLITIS, OVARITIS and PANCREATITIS (as with mumps): also with ANEURYSM OF THE ABDOMINAL AORTA, with a FLOATING RIB and in CROHN'S DISEASE. DIABETIC COMA is sometimes heralded by pain, usually in the epigastrium, which may be very severe (§ 238). Exaggerated abdominal breathing is a useful diagnostic aid.

The causes of abdominal pain which originate from organs outside the abdomen are mentioned in § 238.

X. In ROOT PAIN or REFERRED PAIN abdominal pain may come on suddenly and acutely, and may be for a long time the only symptom.

1. *Nervous dyspepsia* is one of the most typical forms of referred pain. The pain is severe, periodic, but usually relieved rather than aggravated by food or by pressure. The skin may, however, be very sensitive to the flick of a handkerchief.

2. The gastric and vesical crises in association with *tabes dorsalis*.

3. At the onset of *acute poliomyelitis*, pain may be referred to the abdominal wall.

4. *Spasm* or *colic* of any hollow viscus may occur without organic derangement or discoverable nervous cause, especially in nervous subjects. The commonest type is colospasm (§ 252).

5. The neuralgia which accompanies or follows *herpes zoster*.

6. *Coronary thrombosis* causes pain to be referred more to the abdomen than to the chest, but is recognised by the circulatory disturbances (§ 52).

7. *Basal pneumonia*, *diaphragmatic pleurisy* and *blast injuries to the lung* can cause abdominal pain with rigidity.

8. *Migraine* is certainly met with, alternating with abdominal pain.

9. *Acute glaucoma* is an occasional cause (§ 855).

§ 249. **Chronic Abdominal Pain** comes and goes at first, then BECOMES CONTINUOUS with PERIODIC EXACERBATIONS. Here we do not deal with pain which points definitely to lesions of the stomach, liver, spleen or intestines: these are considered in their respective chapters. Abdominal pain is the leading or only symptom in the following conditions:

I. Chronic appendicitis	§ 249
II. Chronic intestinal obstruction (malignant stricture, simple stricture, pressure by a tumour)	§ 320
III. Chronic peritonitis	§ 250
IV. Visceroptosis	§ 251
V. Spastic colon	§ 252
VI. Chronic or mucous colitis	§ 310
VII. Movable kidney	§ 253
VIII. Pain following previous abdominal operations	§ 254
IX. Obscure visceral and spinal disease	§ 255
X. Pancreatic disease	§ 256

The history must be thoroughly investigated, and every organ carefully examined. Three features may afford us important clues :

1. The POSITION, character, degree, and constancy of the *pain*, and the presence of *tenderness* must be observed. (i.) If the pain and tenderness be *generalised*, one may suspect Tubercle or Cancer of the Peritoneum. (ii.) If they be situated chiefly in the *lower abdomen*, one may suspect Appendicitis or disease of the Colon, Bladder, Ovary, Fallopian tubes, or Uterus. (iii.) If the pain be chiefly in the *upper abdomen*, Gastric, Duodenal, Liver or Gall-bladder disease. Thorough and REPEATED EXAMINATIONS of the *abdomen*, *rectum*, and *vagina* are nearly always necessary. The *urine* also should be repeatedly examined for blood, pus and crystals, and the *fæces* (§ 303) for gall-stones. Occult blood (§ 303) and chemical changes pointing to disease of some organ may be detected by expert examination of the *fæces*. If there be general abdominal enlargement, turn to § 257 ; if a localised tumour, turn to § 263. X-ray or special instrumental examinations (§ 240) may yield important information.

2. The AGE of the patient, and the history and duration of the illness should be inquired into. In *children* perhaps the commonest of the obscure causes of chronic abdominal pain are constipation, dietetic errors, intestinal worms, tuberculosis of the peritoneum and Meckel's diverticulum ; in the *aged* cancer of some organ.

3. The STATE OF THE BOWELS, both previous to and at the time of examination. In I., II., and III. above there is constipation, while in some of the other causes there is diarrhœa or irregularity of the bowels.

I. **Chronic Appendicitis** occurs in two typical forms : Chronic, and Recurrent or Subacute Appendicitis. (a) In CHRONIC APPENDICITIS (1) the chief symptom is pain starting from the right iliac fossa, or radiating from the umbilicus or epigastrium to this region. It occurs particularly after food, but the typical time-relationship of gastric or duodenal ulcer is absent, and strict dieting affords only partial relief. The pain is characteristically aggravated by over-exertion. (2) Hæmatemesis may occur from an acute gastric or duodenal ulcer, secondary to the appendicular sepsis. (3) Nausea may occur, apart from vomiting, and sometimes there is alternating diarrhœa and constipation, and (4) a history of general malaise. (5) X-ray will reveal tenderness, fixation or deformities and defects of filling, with prolonged retention of barium in the lumen. One form of chronic appendicitis is due to malignant disease, tuberculosis or actinomycosis of the cæcum or appendix. Another is due to stricture of the lumen with formation of mucocœle of the appendix.

(b) RECURRENT APPENDICITIS has recurring subacute attacks. Here the course of the disease is essentially chronic, and is often associated with colitis. The patient may have months of apparent health, but in most

cases a fresh attack of inflammation occurs sooner or later. It is wise to operate if circumstances permit.

II. *In addition to chronic abdominal pain, there is a history of CONSTIPATION, steadily increasing to COMPLETE STOPPAGE of the bowels and DISTENSION. VOMITING gradually becomes more severe. The case is probably one of CHRONIC INTESTINAL OBSTRUCTION with supervention of acute symptoms.*

In CHRONIC INTESTINAL OBSTRUCTION (§ 320) the abdominal pain is more or less generalised and intermittent. The constipation may at first have alternated with diarrhoea, but after a time it is so complete that not even flatus can be passed. Vomiting, at first of food, and later of alkaline or even fæculent matter, a rapid pulse, and other constitutional symptoms ensue if the condition is not relieved. The commonest causes are Malignant Stricture, Simple Stricture, Peritoneal bands, Diverticulitis, Pressure of a Tumour, Volvulus, and Impacted Contents.

III. *The abdominal pain is chronic and GENERALISED; it is attended by CONSTITUTIONAL SYMPTOMS, and some ABDOMINAL ENLARGEMENT or other local signs. The disease is probably CHRONIC PERITONITIS.*

§ 250. **Chronic Peritonitis** runs a slow and chronic course, and is usually attended by a certain amount of generalised pain. There is a simple or idiopathic chronic peritonitis, but three more frequent forms are: (a) That due to **tubercle**, and (b) that due to **cancer**—two conditions which, by the way, are most frequently met with at the opposite extremes of life, and present a marked contrast both in their clinical and anatomical features; (c) Rupture of a papilliferous ovarian cyst (§§ 243, 261).

CHRONIC TUBERCULOUS PERITONITIS is known by (1) the patient is young; (2) pain and tenderness; (3) localised hard masses or a general doughy feeling; (4) often fluid, and (5) always emaciation and fever. Hence the disease is fully discussed under the heading of emaciation in § 557.

CHRONIC CANCEROUS PERITONITIS (Cancer of the Peritoneum) is always attended by much pain, constant, and also in paroxysms. There is a great tendency to the rapid formation in the abdominal cavity of fluid which is nearly always tinged with blood. It arises only in late middle or advanced life. Its recognition is easy in typical cases on account of the age, acute pain, and ascites (under which heading it is described, § 260). SARCOMA of the peritoneum is rare.

CHRONIC PERITONITIS of the simple or idiopathic type is very difficult to diagnose in the majority of cases, because of the extreme variability and vagueness of the symptoms. (1) Pain and tenderness, sometimes localised, are present, worse at times and with exertion; (2) dyspepsia, often constipation, sometimes vomiting; (3) malaise with pyrexia from time to time; (4) palpation may detect localised thickenings and areas of resistance which convey a doughy sensation on palpation; (5) ascites is present in some cases; in other cases it is absent, and the abdomen is quite flat.

Etiology.—(1) After an attack of acute peritonitis; (2) inflammation of any organ may cause localised peritonitis; (3) after paracentesis without strict asepsis; (4) idiopathic, due to unknown causes. It may occur with chronic nephritis, with cirrhosis of the liver, and with other general conditions, in which two or more of the serous

membranes (pleura, pericardium) become simultaneously affected (polyorrhomenitis or polyserositis).

The *Diagnosis* has often to be made by a process of exclusion, especially when there is no history of acute peritonitis nor of inflammation of any organ. Sometimes it is indistinguishable from tuberculous and cancerous peritonitis. Abdominal pain simulating colic may be due to peritoneal adhesions. When ascites reappears after repeated tapplings peritonitis is usually present.

The *Prognosis* as to life is good in mild cases, though chronic invalidism is apt to ensue. Subacute attacks are liable to occur, and there may be great exhaustion and emaciation from involvement of some part of the alimentary canal, or from the formation of local abscess. Adhesions may lead to intestinal obstruction. When associated with advanced hepatic or renal disease, the prognosis is grave.

Treatment.—Rest and supporting belts may give relief. Inunction with blue ointment or applications of Liq. Iodi Mit. (B.P.) (1 in 3 of water) are useful. Paracentesis and surgical treatment may be required.

IV. § 251. **Visceroptosis** (Synonyms: Glénard's disease, enteroptosis) is a condition with ptosis or downward displacement of one or all of the abdominal organs. It is more common in the thin nervous woman, and has various causes. When ptosis is accompanied by membranes superimposed on the lengthened mesentery, obstructions and "kinks" tend to form, which give rise to varied symptoms. Progressive loss of intra-abdominal supporting fatty tissue, and weakness of the abdominal muscles are other factors which hasten the onset of symptoms. *Symptoms* are: (1) Pain or dragging and "sinking" feelings in the abdomen or back, palpitation and dizziness; (2) dyspepsia, sometimes nausea and vomiting severe enough to imitate a gastric ulcer; (3) constipation, often alternating with diarrhoea; (4) intestinal stasis, causing symptoms of toxic absorption, such as lethargy, headache, skin pigmentation, fatigue, and nervousness; (5) anæmia is common.

The *diagnosis* from gastric ulcer and appendicitis in young women, and malignant disease in old people, may be very difficult; but when palpation reveals a gurgling cæcum, and prolapse of kidneys and stomach, medical treatment can be safely tried. X-ray examination of a pronounced case shows a prolapsed stomach, the lower border reaching the pelvis, a mobile and elongated duodenum, a dilated and prolapsed cæcum, the transverse colon low in pelvis, and an elongated pelvic colon. Lane's chief "kinks" are obstructions in the terminal coil of the ileum and of the ascending or sigmoid colon due to adhesions causing pressure and narrowing of the lumen of the intestine. When X-ray examination is not available, the condition is usually detected by percussion and palpation of the abdomen, and inspection in the upright position.

Treatment.—Prevent toxic absorption by aiding free elimination, and by giving food which causes less toxic residue. The first is accomplished best by paraffin and bassorin preparations together with aperients; the second, by a lacto-vegetarian and vitamin-containing diet, with restriction of meat and abundance of fresh fruit and vegetables. A well-fitting and correctly applied abdominal belt, such as the Curtis belt, aids mechanically by holding in better position the dropped viscera, and relieves the

pain and dragging sensations. Fattening the patient and treating anæmia act similarly. Massage, electricity (rhythmic faradic or sinusoidal currents) and exercises afford support by developing the abdominal muscles. Rest with the foot of the bed raised and other measures to aid the nervous symptoms are necessary; a modified Weir-Mitchell treatment is often useful. Operations are better avoided.

V. § 252. **Spastic Colon** (Syn. : Colospasm) occurs in young or middle-aged adults.

Symptoms.—(i) Pain over the line of the colon, usually of a nagging or burning character, is most marked in the descending or sigmoid colon: often more of a severe continuous discomfort than a true pain, it is liable to colicky exacerbations, which may be most marked *after* a bowel evacuation. (ii) The colon is felt as a tender contracted tube in spasm. Often the patient accurately delineates the colon along its whole course. (iii) Constipation results from the spasm. (iv) The stools are often thin and pencil-like in form, and may be passed in several small portions during the day. (v) Between the bouts of constipation diarrhœa may result from aperients taken to relieve the condition. (vi) Frequency of micturition and eczema of the umbilicus may co-exist.

Etiology.—Colospasm probably results from an overaction of the parasympathetic nerves, and usually occurs in overactive persons, especially when worried or fatigued, or in cold weather. It is unusual to find any other organic disease of the colon, but secondary spasm may follow chronic or mucous colitis. Diverticulosis and diverticulitis are recognised complications.

Treatment.—It is difficult to free the patient permanently from this condition. A warm flannel belt should be worn at all times; the general health must be attended to, with adequate holidays and the avoidance of fatigue. Irritating foods as well as irritant purgatives must particularly be avoided; phenolphthalein seems to be especially detrimental. Liquid paraffin, without or with agar-agar, small regular doses of belladonna, eumydrin, or phenobarbitone, and small enemata may be used.

VII. § 253. **Movable Kidney** (Dropped, Dislocated, or Floating Kidney, according to the degree of mobility).—This condition is by no means uncommon and does not usually give rise to symptoms unless the degree of mobility is considerable.

The *Physical Signs* can only be discovered by palpation of the abdomen, with the patient lying down. The method of palpating the kidneys is given in § 394. With the patient in the erect or sitting posture, the kidney comes down more during inspiration than when lying down. After a little practice the patient will be able to lean forward and relax the muscles, which is an important aid to the observer. The left kidney rarely falls below the umbilicus, but the right one may be displaced into the iliac fossa, and even into the pelvis.

Symptoms.—In a few cases two kinds of pain may be experienced: (a) A constant dull, dragging pain in the back, or perhaps only an uneasiness in the loin, radiating down to the groin and inner side of the thigh, relieved by rest; (b) Attacks like renal colic may be followed by the passage of urine in large quantities, occasionally with albumin and blood, due to vascular engorgement of the kidney—"Dietl's crises" (§ 414). Sometimes hydronephrosis results. Neurasthenia often follows, with mental depression or symptoms of dyspepsia, vertigo, diarrhœa, or constipation.

Etiology.—A much larger percentage of women than of men have movable kidney: it often follows pregnancy. A fall or strain will also displace the organ, and that is why it is advisable for those with spare abdominal muscles to wear a belt when at work in the gymnasium. It occurs more often in tall, narrow-chested than in short people. Rapid loss of fat, or lowering of the intra-abdominal pressure, such as occurs after delivery, are frequent causes.

Treatment.—Bromides and rest will relieve the patient for a time, and any concurrent dyspepsia must be remedied; but the best treatment consists in wearing a proper form of belt and improving the health. The abdominal belts supplied by

instrument makers are not always successful, but an apparatus is designed for applying additional pressure inside the belt; and in some cases pads over the kidney can be introduced between the belt and the abdominal wall. Fattening the patient, abdominal exercises, and sleeping on an inclined plane with the foot of the bed raised, often relieve symptoms.

VIII. § 254. **Pain Following Previous Abdominal Operations.**—After previous operations intra-abdominal adhesions may form or nerves supplying the abdominal wall itself may be involved in the scar tissue and give rise to persistent pain. The latter variety may be differentiated by using a local anæsthetic to block the intercostal nerves before they reach the abdominal wall. If this relieves the pain, a more permanent effect may be obtained by the subsequent blocking of nerve impulses with a few c.c. of 90 per cent alcohol: a few applications of abdominal diathermy softens scar tissue and gives relief.

IX. § 255. **Incipient or Obscure Visceral or Spinal Disease.**—(a) In cases of chronic pain GENERALISED OVER THE ABDOMEN, and in the absence of constipation, diarrhœa, or any of the causes mentioned under § 248 onwards, one might suspect cancer of the intestines, of the pancreas, or of the kidney, cancer or tubercle of the suprarenals (*i.e.*, Addison's disease, in which pain in the epigastrium is a constant symptom), "rheumatism" of the abdominal muscles, visceroptosis, or movable kidney. In many cases the pain is an expression of a psychoneurotic anxiety state. Children may suffer from recurrent attacks of abdominal pain due to worms: but often no cause can be found. Such cases should be treated as incipient intussusception—that is to say, avoid purgatives and give digestible foods and enemata.

(b) In various spinal affections the pain is frequently referred to the FRONT OF THE ABDOMEN, and among the more obscure causes may be mentioned abdominal aneurysm pressing on the spine, and cancer or caries of the vertebræ. The first of these occurs mostly in male adults, the second in the aged, and the third (Pott's disease) in children. In the latter the child frequently refers to the pain as "stomach-ache," worse after sneezing or running about. The girdle pain due to a spinal cord tumour, chronic and acute myelitis and the prodromal stages of the exanthemata should also be borne in mind.

(c) If the patient complains of PAIN SITUATED CHIEFLY IN THE LOWER ABDOMEN, one might suspect diseases of the intestine or rectum, appendicitis (§§ 247, 249), cancer or other disorders of the bladder, psoas abscess, lymphatic gland enlargement, and pelvic peritonitis (in which the pain shoots down the legs), extra-uterine pregnancy, pyosalpinx, dysmenorrhœa and all its causes, pelvic displacements, tubercle or cancer of the prostate or testes, sacro-iliac arthritis and obturator hernia. The fatigue pains of debilitated women may be referred to one or other iliac region.

(d) PAIN SITUATED CHIEFLY IN THE UPPER ABDOMEN may be due to various affections of the stomach, duodenum, liver or gall-bladder, and spleen. In lesions of organs in this region pain is often referred to the scapula or the root of the neck. Among the painful affections of the *stomach* may be mentioned gastric (or duodenal) ulcer, gastritis (acute or chronic), cancer of the stomach, which in its most usual form, scirrhus of the pylorus, is commonly difficult to diagnose in its early stages. Among the painful affections of the *liver and gall-bladder*, perhaps passive congestion, perihepatitis, cancer, gall-stones and chronic cholecystitis are the commonest; hydatid is one of the obscure conditions, though it is rarely painful. Abscess of the liver should be suspected in those who have resided in tropical countries. Painful affections of the *spleen* are not common, the chief being infarction, but the capsule is sometimes the seat of perisplenitis: enlargement of the organ aids diagnosis.

X. § 256. **Diseases of the Pancreas** are fortunately rare, for they are often unrecognisable during life. When definite physical signs of tumour are present, the diagnosis is not so difficult. The **symptoms** commonly present are: (1) Abdominal pain is present in a proportion of cases, and is deep-seated in the epigastrium, often with associated pain in the upper lumbar region; (2) progressive loss of weight commences

early; (3) digestive disturbances are vaguely related to meals and include nausea, anorexia, vomiting, diarrhœa or constipation; (4) general debility and depression; (5) the passage of large pale, bulky stools containing a large amount of unsplit fat; (6) sugar tolerance is usually reduced. Certain tests for normal secretion of the pancreatic juice may be applied. (1) *Examination of the Fæces*. If pancreatic digestion is deficient, proper digestion of all three classes of food substances will be deficient; (a) creatorrhœa, or the passage of undigested meat fibres, with striæ visible under the microscope; (b) steatorrhœa, or the passage of large quantities of *unsplit* fat in the stools (if only biliary obstruction is present, large quantities of split fat are passed in the stools in the form of soaps and fatty acids, see § 303); (c) large quantities of undigested starch granules. (2) Increase of *diastase* in the urine and blood, with decrease in the stools. Diastase is the ferment which changes starch into sugar. Normally, an average of 20 units per c.c. is excreted daily in the urine. In cases of obstruction of the pancreatic duct, it may be increased to 300–400 units. When renal activity is impaired, there is less diastase in the urine but more in the blood.

The test measures the amount of starch digested in a given time by a definite quantity of urine. A twenty-four-hours' sample of urine is required, and is made just acid to litmus, also (i.) 0.1 per cent. solution of soluble starch; (ii.) 0.9 per cent. solution of NaCl; and (iii.) a weak solution of iodine. Ten test-tubes are numbered 1 to 10. With 1 c.c. pipette, place in tube No. 1, 0.9 c.c. urine; and then in tubes 2–5, 0.6 c.c., 0.4 c.c., 0.2 c.c. and 0.1 c.c. respectively. For further dilutions of the urine dilute some of the original urine ten times with the saline solution, and into tubes 6–10 place 0.9 c.c., 0.6 c.c., 0.4 c.c., 0.2 c.c. and 0.1 c.c. of the diluted urine. Fill each tube with saline solution to 1 c.c. The tubes now contain 0.9, 0.6, 0.4, 0.2, 0.1, 0.09, 0.06, 0.04, 0.02, and 0.01 c.c. of the original urine. Add to each tube 2 c.c. of the starch solution, shake, and incubate or stand in a water bath at 37° for half an hour. Then remove the tubes to cold water and immediately add 2–3 drops of the iodine solution to each tube, and shake. Notice when the change occurs from the blue to the slight pink tinge. The first tube showing this contains just enough diastase to digest the starch. Divide 2 (the number of c.c. of starch) by the number of c.c. of urine in that tube. Suppose it was tube No. 7. Then $\frac{2}{0.06} = 33$ units of diastase. (3) In cases where there is deficiency

of the *production of insulin*, glycosuria and lowered sugar tolerance are found.

Less reliable tests are (4) Sahli's test: capsules of gelatin hardened in formalin so that they are digested only by the trypsin of a healthy pancreas, and containing a drug which is readily detected in the urine; (5) Loëwi's test: three drops of 1 in 1000 adrenalin dropped on the conjunctiva, and repeated five minutes later. If the pupil dilates in half to one hour, one can conclude that there is irritability of the sympathetic, which is frequent with pancreatic disease.

1. PANCREATIC CYSTS are of two types: (a) the rare true cyst which contains pancreatic ferments; (b) the false cyst containing no ferments. True cysts are due to obstruction or obliteration of the duct by pancreatic calculi, or cicatricial contraction. False cysts are due to injury or follow acute pancreatitis. The swelling appears between the stomach and the colon, and does not move with respiration. Fatty diarrhœa is rare. In the true cyst the fluid will emulsify fat, convert starch into sugar, and digest fibrin.

2. PANCREATIC CALCULI are small concretions consisting chiefly of calcium carbonate. They are visible on X-ray examination, a diagnostic feature which distinguishes them from the majority of biliary calculi.

3. ACUTE PANCREATITIS is met with in three forms: (a) *Acute Hæmorrhagic Pancreatitis*, which sets in suddenly with agonising pain, and often results in death in one to four days (§§ 244, 245). (b) *Acute Suppurative Pancreatitis* begins suddenly with pain and irregular pyrexia, and may lead to death in three or four hours, but may become chronic, and last some months. There may be a large abscess in the lesser sac. (c) *Gangrenous Pancreatitis*, with necrosis of the organ, is very rare. (d) *With*

Mumps. At the end of the first week the temperature rises again, with headache, nausea, vomiting, epigastric pain and tenderness, backache and often profuse sweating. It runs a favourable course and the symptoms subside in 4 to 5 days.

4. CHRONIC PANCREATITIS is a fibrosis of the organ which mostly runs a latent course. It may be associated with diabetes. The onset is insidious; discomfort and distension in the epigastrium are felt after meals, with drowsiness. Borborygmi and offensive stools, anæmia, and emaciation follow. Paroxysmal pain may be complained of above and to the right of the umbilicus, and tenderness can be elicited there. The pain may be referred to the left scapula. Later, the common bile duct is compressed by the pancreas and produces obstructive jaundice, with dilatation of the gall-bladder, and thus resembles cancer of the head of the pancreas. Later still, there may be pressure on the duodenum and inferior vena cava.

The diagnosis is difficult in early stages, and requires expert analysis of the excreta (see above). Later, the stools are fatty and so characteristic that the condition can be diagnosed by the naked eye.

PANCREATIC DIABETES. The most common type of diabetes mellitus is that due to disease of the islets of Langerhans in the pancreas (§ 416).

5. CANCER OF THE PANCREAS may be primary or secondary, and is a rare condition. The symptoms are: (1) Pain in the epigastric and lumbar regions is often present. At first it occurs in paroxysms, then becomes constant, and runs a chronic course. (2) Loss of weight is early and persistent. (3) Digestive symptoms, with anorexia, flatulence and periodic diarrhœa or vomiting are not directly related to meals. (4) Obstructive jaundice, intense and persistent from the pressure on the bile-duct, is present in 70 per cent. of the cases, and sometimes pain like biliary colic accompanies this. The gall-bladder is then enlarged. (5) Other symptoms as above described. (6) Later on a tumour is found in the epigastrium or in the umbilical region, with little or no mobility, deep-seated, and hard to define. (7) Œdema and phlebitis of the legs, from pressure on the inferior vena cava, and ascites may occur. (8) The spleen and liver may enlarge when their venous return is obstructed. Metastases usually occur late in the disease.

The *Diagnosis* of cancer and other tumours of the pancreas is difficult. A tumour of the liver, pylorus, or transverse colon, is more mobile; pancreatic tumours do not move with respiration. Much indicanuria points to an intestinal rather than to a pancreatic tumour. No great stress can be laid on the presence of fat in the fæces, or on glycosuria, but abundant undigested muscle fibre found in the fæces is more characteristic of pancreatic disease. Increase of diastase in the urine and steatorrhœa point to pancreatic disease.

Prognosis.—In cancer of the pancreas death usually occurs soon after the onset of jaundice, or within six weeks after ascites sets in. The complications are: (i.) Symptoms due to pressure on the neighbouring organs—intestine, pylorus, or portal vein; (ii.) sudden hæmorrhage into the alimentary tract or the peritoneal cavity; (iii.) pulmonary embolism.

Treatment is mainly symptomatic. Starches and sugars should be limited. Milk and casein are the most digestible forms of protein in pancreatic disease. The administration of pancreatic extracts may aid the digestion. Duodenal catarrh may be allayed by bismuth salicylate; and hexamine disinfects the biliary passages. In pancreatitis the jaundice has been relieved by cholecyst-gastrostomy. Other surgical measures are employed for the several diseases of the pancreas.

GENERALISED ABDOMINAL ENLARGEMENT

Difficulty in the diagnosis of the cause of abdominal enlargement can often arise in cases of obesity, constipation, pregnancy, venous congestion, atony or ptosis of the abdominal organs. And see Fallacies, § 240, for the less common sources of error.

§ 257. **Classification.**—Generalised abdominal enlargement occurs under four conditions :

- | | |
|---------------------------------------------------------------------------------------|-------------|
| I. Gas in the intestines (tympa ⁿ ites), or occasionally in the peritoneum | § 258 |
| II. Fluid free in the peritoneum (ascites) | § 260 |
| III. A cystic collection of fluid in the abdomen | § 261 |
| IV. Solid abdominal tumours | §§ 262, 263 |

The **Routine Procedure**, as previously described (§ 241), should be by Inspection, Palpation, Percussion, Auscultation, and Mensuration.

If a **hard tumour** can be felt in any part, turn first to § 262.

If the abdomen is quite **soft to palpation** and **resonant** all over, turn first to § 258.

If the abdomen is **dull to percussion** in the flanks, and presents a fluid thrill, turn first to § 260.

If the abdomen is **resonant in the flanks** and **dull in front**, turn first to § 261.

The abdomen is uniformly enlarged ; it is SOFT and yielding to palpation ; percussion, systematically conducted over the whole area, gives a RESONANT note. The swelling is probably due to TYMPANITES.

§ 258. **Tympanites** is the term employed for a flatulent distension of the stomach and intestines by gas. It should be remembered that flatulent distension may accompany and render obscure a *small quantity of fluid in the peritoneum*.

The *Causes* of tympanitic enlargement are as follows :

I. Atonic and other forms of **DYSPEPSIA** and **AEROPHAGY** (air swallowing) are the most frequent causes of flatulent abdominal distension. It is usually intermittent, and generally greatest after meals (§ 283).

II. In **ATONY OF THE COLON** the bowels are constipated, and the patient is liable to "colicky" pains ; and the constitutional symptoms are few except when there has been prolonged toxæmia (§ 317).

III. In **TUBERCULOUS PERITONITIS** there is a tendency to the formation of intestinal adhesions and *flatulent distension*. Moreover, the distended abdomen has a doughy feel and here and there a patch of dulness on percussion, which is quite characteristic (§ 557).

IV. "**PHANTOM TUMOUR**" may assume the shape of a generalised more or less resonant enlargement, but it more often resembles a localised tumour (§ 262). It disappears during anæsthesia.

V. In **INTESTINAL OBSTRUCTION** there is considerable abdominal distension, accompanied by pain, vomiting, and other general constitutional disturbance (§§ 319 and 320).

VI. **PARALYTIC ILEUS** causes general distension of the abdomen (§ 319).

VII. **ACUTE DILATATION OF THE STOMACH** causes distension in the left hypochondrium and persistent copious vomiting (§ 295).

Gas in the Peritoneal Cavity gives much the same signs as tympanites, but there is extreme distension, and hyper-resonance all over to such a degree that the normal dulness of the liver and spleen is obscured. It

is met after perforation or rupture of some part of the alimentary canal. The patient is shocked, and presents all the symptoms associated with perforation (§ 243). A few hours after the occurrence of the perforation a delusive lull occurs in the shock and other symptoms, only to be succeeded by a fatal exacerbation. Perforation of a peptic ulcer is the commonest cause, and one of the diagnostic features of this condition is the loss of the normal area of liver dulness.

There is uniform abdominal enlargement, which is soft and yielding to palpation and DULL TO PERCUSSION in parts; a FLUID THRILL is present. There is FLUID WITHIN THE ABDOMEN.

§ 259. When there is **Fluid in the Peritoneal Cavity**, either free or encysted, the abdomen is soft to palpation, dull to percussion in parts (either in the flanks or in front), and measurements show it to be enlarged.

When the fluid is in any quantity, two special signs can be elicited. (1) *Fluid thrill*.—A thrill can be transmitted from one hand to the other, through the surface of the fluid. Place the left hand over one side of the dull portion, and tap sharply with the fingers of the right hand over the opposite side; an impulse or thrill will be felt by the left hand when fluid is present. To prevent the wave or impulse from travelling across the abdominal wall, instead of through the fluid, an assistant should place the edge of his hand vertically on the umbilicus. (2) In some cases of free fluid in the peritoneum, on suddenly dipping the fingers over a solid organ (*e.g.*, the liver), a characteristic sensation, due to displacement of fluid, can be felt. Neither of these signs can be elicited with a gaseous enlargement or a solid tumour. In *obese persons* considerable difficulty arises in the detection of fluid.

The fluid may be either (a) **FREE** in the peritoneal cavity, when it is termed ascites; or (b) enclosed in a **CYST**, such as an ovarian cyst.

(a) If **FREE** in the peritoneal cavity, it will obey the law of all fluids, and *shift with the position of the patient*. Thus in ascites (§ 260) when the patient lies on his back both flanks are dull to percussion, and the epigastric region is resonant; then, if the patient turns on one side the uppermost flank which before was dull is now resonant, while the epigastric region, if there is much fluid, is dull (shifting dulness). Much may be learned from the character of the fluid withdrawn by a cannula. Ascitic fluid is usually straw-coloured, with much albumen. Hæmorrhagic fluid usually means cancer (§ 919).

(b) If the fluid is **ENCYSTED**—*e.g.*, ovarian cyst, we can still elicit the fluctuation and the percussion tests just referred to, but the level of the dulness will not alter with the position of the patient (§ 261). In many cases fluctuation can be felt on bimanual examination. In every case a catheter should be passed to avoid overlooking a distended bladder.

There is a generalised uniform enlargement of the abdomen, which gives all the SIGNS OF FLUID, and the fluid ALTERS ITS LEVEL with the position of the patient. The condition is ASCITES.

§ 260. **Ascites** is a term applied to an effusion of fluid within the peritoneum. The physical signs of fluid have been described above. It is sometimes difficult to detect a very small quantity of fluid in the peritoneum, but its existence is rendered probable (i.) by the dulness on percussion of the umbilical region with the patient on his hands and knees; (ii.) by finding that when the patient turns from one side to the other, the flank which was dull is now resonant. On rectal examination fluid may be detected at an early stage when it has gravitated to the pelvis, and it may be detected here when it is insufficient to give other signs.

Ascites may have to be *Diagnosed* from any of the cystic conditions mentioned below (§ 261), but certainly the most frequent and important source of difficulty is *ovarian cyst* (Table XV, p. 315). Occasionally peritoneal adhesions (especially cancerous) may confine the fluid to one part of the abdomen, and then the fluid does not shift with the position of the patient. A greatly distended urinary bladder may simulate ascites, but the passage of a catheter readily excludes this fallacy.

The other *Symptoms* which accompany ascites belong to two categories: (1) Those due to pressure within the abdomen—*e.g.*, œdema of the feet and legs, from pressure on the inferior vena cava and its branches; later on dilatation of the surface veins of the anterior abdominal wall may occur from the same cause; albuminuria from pressure on the renal veins, and dyspnœa from undue elevation of the diaphragm (and often an accompanying pleural effusion). (2) There are evidences of the condition which has caused the ascites, and of all the causes by far the commonest is peri-portal cirrhosis of the liver. The temperature is generally normal, except in chronic peritonitis.

The *Causes of Ascites* are six in number. In reference to the diagnosis of these causes, if there be any œdema of the ankles, it is important to ascertain whether this œdema or the ascites came first. For instance, when PORTAL OBSTRUCTION is in operation, the dropsy of the feet will have started subsequently to the ascites; in HEART or LUNG disease it will have preceded the ascites; whereas in RENAL DISEASE they would have started about the same time. ASCITES with well-marked JAUNDICE in an old person is extremely likely to mean CANCER OF THE LIVER or peritoneum. ASCITES with SALLOWNESS of the skin in a MIDDLE-AGED person is most probably due to ALCOHOLIC CIRRHOSIS of the liver. For Ascites due to TUBERCULOUS PERITONITIS see § 557.

I. **Portal Obstruction** is the commonest cause of well-marked ascites. This is recognised in two ways: (a) By a history or presence of the *symptoms* of portal obstruction (of which ascites is only one); and (b) the presence or a history of one of the *causes* of portal obstruction.

(a) The SYMPTOMS of portal obstruction, in the order in which they usually appear, are as follows: (1) A liability to attacks of flatulence and of gastric and intestinal catarrh, as evidenced by pain in the stomach, flatulent dyspepsia, alternating diarrhœa and constipation, and the vomiting of mucus streaked with blood, especially in the early morning before

breakfast. (2) Hæmorrhoids and enlarged œsophageal veins. (3) Hæmorrhage, sometimes in very large quantity, from hæmorrhoids or from the stomach. (4) Congestion, and therefore enlargement of the spleen. (5) ASCITES is one of the later results. (6) Enlargement of the veins of the abdominal wall from the establishment of a collateral circulation. (7) Œdema of the legs also appears subsequent to the ascites, and is due to pressure on the large veins in the abdominal cavity by the ascitic fluid. (8) Albumen in the urine may arise in the same way, or from concurrent disease of the kidney; in the former case the albuminuria may disappear after paracentesis.

(b) The CAUSES of portal obstruction may be grouped into (a) diseases within the liver, or (β) diseases outside it.

(a) *Diseases within the Liver.*—*Cancer* is the chief cause; it produces portal obstruction usually by the pressure of the enlarged glands in the fissure, or by masses protruding from the liver. *Chronic Interstitial Hepatitis (Atrophic cirrhosis)* is often due to alcoholism, there being a history of this and of alcoholic dyspepsia. Simple ascites without marked jaundice or other obvious symptoms is presumptive of cirrhosis. A large *gumma* at the portal fissure may obstruct the portal vein. *Perihepatitis* sometimes produces ascites by thickening of the capsule (sugar-loaf liver). Ascites only very rarely accompanies *hepatic congestion*, and never fatty liver, hydatid, or abscess.

(β) The causes of portal obstruction *outside the liver* are: (1) *Cancer* of the stomach or pancreas, and various other tumours pressing on the vein. (2) Enlargement of the *glands* in the fissure of the liver (cancer, tubercle, syphilis or lymphadenoma). (3) *Thrombosis* of the portal vein is rare.

II. In **Heart Disease**, either primary (*e.g.*, mitral disease and cardiac dilatation) or secondary to lung mischief, the ascites is generally part of the dropsy affecting the cellular tissues and other serous cavities of the body. Here dropsy of the feet *will have preceded the abdominal dropsy*, and there will be a previous history of palpitation, dyspnœa, and perhaps cough. Examination of the heart will reveal the nature of the disease.

III. In **Kidney Disease** ascites may be part of a General Dropsy affecting the face, limbs, peritoneum, pleuræ, and pericardium. The fact that the dropsy started in all of these situations about the same time reveals this cause. Albuminuria is frequently enough a consequence of the pressure of the ascitic fluid, but the presence of epithelial casts almost certainly indicates that the renal disease was primary. It usually takes the form of acute or subacute parenchymatous nephritis, rarely waxy or granular kidney.

IV. **Chronic Peritonitis** is another cause of fluid in the peritoneum. An idiopathic form of chronic peritonitis is sometimes described, but it is practically never met with apart from a deposit of tubercle (in the YOUNG), § 557, or of cancer (in the AGED), § 250.

V. CHYLOUS ASCITES, or the collection of chyle in the peritoneal cavity, occurs as the result of obstruction of the thoracic duct, or it may occur after trauma, or in spleno-medullary leukæmia. In tropical countries it is more often due to *Filaria bancrofti*.

The *Prognosis and Treatment of Ascites* are very largely those of the causal condition. The *Prognosis of Ascites due to portal obstruction* depends very much on the nature of the intra- or extra-hepatic lesion which has produced it, as given above and in Chapter XII. The degree of the obstruction is measured by the amount of ascites and other symptoms present, and still better by the amount and frequency of the hæmorrhage that has taken place from the stomach or intestines. Life may be prolonged for many years even when a considerable amount of ascites has accrued, provided it has come on slowly, and time has thus been afforded for the gradual establishment of the collateral circulation through the surface veins of the abdomen and other collateral channels. It is in this sense that repeated tapplings are good, for in this way time is gained for the establishment of collateral circulation. In cases of alcoholic cirrhosis the habit must be abandoned, otherwise the patient cannot live longer than six to twelve months, for ascites indicates an advanced condition of cirrhosis; cases treated early may recover.

The *Treatment of Ascites*, like its prognosis, must depend upon its cause (*q.v.*). The treatment of *ascites due to portal obstruction*, and to some extent that of other forms, is as follows: (1) Diuretics may be successful in causing fluid absorption and excretion. Urea (gms. 15-30 b.d.), diuretin, mersalyl or theocine are often effective diuretics, but they must be used cautiously. (2) Salt-free diet often helps to prevent re-accumulation of fluid. (3) Paracentesis is generally necessary sooner or later. Some physicians say it should be put off until it is called for by the urgency of dyspnoea. In cancer this is certainly a good rule, but in cirrhosis of the liver it is best to operate at once in all cases where there is much fluid, unrelieved by medicine. Often diuretics which were useless before, are efficacious after the operation, because the kidneys are relieved from pressure. Sometimes recovery takes place after repeated paracentesis, because time is thus afforded for the establishment of the collateral circulation. It is best to use a small trocar with the tube conducted to a pail, so that the peritoneum may gradually empty itself. With a large trocar leakage may remain, or peritonitis ensue. By the Talma-Morison surgical method the omentum is transplanted between the layers of the abdominal wall to facilitate anastomosis between the vessels of the portal and the systemic circulations.

There is a generalised abdominal enlargement which gives all the SIGNS OF FLUID (§ 259); but the fluid does NOT ALTER ITS LEVEL with the position of the patient. There is ENCYSTED FLUID IN THE ABDOMEN.

By far the commonest of such cystic tumours is an OVARIAN CYST. Other and less common cystic abdominal tumours are PREGNANCY WITH HYDRAMNIOS, CYSTIC FIBROMA of the uterus, HYDRO- and PYO-NEPHROSIS,

PANCREATIC OR MESENTERIC CYST, a large HYDATID, a MUCOCŒLE of the GALL-BLADDER, and an ENCYSTED ASCITES.

§ 261. I. **Ovarian Cyst** is centrally situated, and grows from below upwards. It is attached to the pelvic organs, it can be moved laterally but not upwards. The enlargement is fairly uniform, and gives all the signs of fluid (§ 259). But the level does not alter with the position of the patient; and whereas the umbilical region is dull on percussion ("horse-shoe shaped dulness"), the flanks are resonant. On palpation it is tense and elastic, and in malignant ovarian cysts nodules can be felt in the walls. Ballotement between the two hands on combined abdominal and pelvic examination is often a most useful sign.

TABLE XV.

DIFFERENTIAL DIAGNOSIS OF ASCITES AND AN OVARIAN CYST.

	<i>Ascites.</i>	<i>Ovarian Cyst.</i>
<i>Inspection.</i>	Flanks bulge, front flat. ¹	Flanks flat, front bulges.
<i>Percussion.</i>	Flanks dull, front resonant. On turning, upper flank becomes resonant.	Flanks resonant, front dull. No alteration of dulness on turning.
<i>Measurement.</i>	Umbilicus to xiphoid greater than umbilicus to pubes. Circumference at umbilicus greater than slightly below. Navel to iliac spine same both sides.	Umbilicus to xiphoid less than umbilicus to pubes. Circumference at umbilicus less than slightly below. Navel to iliac spine greater one side than the other.

The features associated with it are (1) a history of it having grown upwards from the pelvis, and (2) these tumours (unlike encysted ascites) may be of very rapid growth, and reach quite a large size in three or four months. (3) There have usually been menstrual irregularities, though by no means always. (4) The cyst may be clearly felt by bimanual examination of the pelvis. There may have been no general symptoms of any kind, but generally some pain and local discomfort have been complained of. Often when the cyst contains pus there is little or no fever. When there is a history of attacks of pain, it generally indicates adhesions, an important matter to the operator. An examination of the uterus usually reveals nothing. A malignant papilliferous cyst is indicated by (1) the presence of nodules in the walls; (2) the age of the patient, a history of emaciation, and severe pain; (3) later ascites and œdema of the legs.

Diagnosis.—In the *earlier stages* the diagnosis of an ovarian tumour is sometimes difficult. It is an elastic, movable, and globular swelling; the uterus is not enlarged and can be defined as quite separate from the tumour. In this stage it may have to be diagnosed from *hydro-* or *pyosalpinx*. *Pelvic peritonitis* and *cellulitis* and *pelvic hæmatocele* form a swelling which is very firmly fixed in the pelvic cavity and accompanied by constitutional symptoms. In *extra-uterine fœtation* there would be

¹ Bulging in front may occur in cases with large and acute effusion.

morning sickness, a patulous os uteri, and other symptoms of pregnancy, with an empty uterus, and a positive Zondek-Aschheim Test.

In the *later stages* ovarian cysts have to be diagnosed from all the conditions mentioned below.

II. PREGNANCY WITH HYDRAMNIOS and a thin uterine wall is sometimes very difficult to diagnose from an ovarian cyst, for both develop very rapidly. Experienced clinicians have been known to fail in the differentiation. The symptoms of pregnancy (see § 447), the exactly central position of the tumour, and the softened cervix, may aid. The test for pregnancy and, later, an X-ray examination, settle the diagnosis. *Hydatid mole* presents similar difficulties, but it is fortunately rare.

III. LARGE CYSTIC FIBROID of the uterus, especially of the subperitoneal (pedunculated) variety, may produce the signs of a fluid tumour. It is recognised by (1) its connection with the uterus, which is enlarged; (2) its slow growth, which may extend over many years; and (3) menorrhagia in some cases.

IV. A LARGE HYDATID CYST of the spleen or liver, a HYDRO- or PYONEPHROSIS, a dilated GALL-BLADDER, a large PANCREATIC, OMENTAL, or MESENTERIC CYST, or a large PERITYPHLITIC ABSCESS, may on rare occasions produce the appearance of a general fluid enlargement of the abdomen, and may require to be diagnosed from ovarian cyst; but they are nearly always *asymmetrical*. They grow from, and their percussion dulness is continuous with, the organs whence they rise; they are referred to among Abdominal Tumours (§ 263).

V. ENCYSTED ASCITES is not common. It may result from previous peritonitis, of which there will probably be a history. More frequently, perhaps, it results from tubercle or cancer of the peritoneum (§ 250). In all of these there is a want of symmetry in the enlargement and in the fluid, an absence of the associated symptoms of ovarian tumour, and a history or other evidences of the cause in operation.

VI. PNEUMOCOCCAL PERITONITIS in children may form an encysted swelling, but this is accompanied by a swinging temperature.

The *Prognosis* of ovarian tumour is always serious, though in the non-malignant form it may be quiescent for some years. If not treated, a cyst may (1) rupture and produce peritonitis; (2) it may become infected; (3) the pedicle may become twisted; (4) hæmorrhage may take place into its cavity; (5) occasionally it bursts into the bowel with sinus formation.

The *Treatment* is entirely surgical. The earlier the cyst is removed the better. It is well to do this before the occurrence of attacks of pain indicate inflammatory adhesions.

ABDOMINAL TUMOURS.

§ 262. **Method of Procedure.**—We now turn to the second group of abdominal enlargements—namely, those in which the enlargement has originated in, or is localised to, one part—*i.e.*, Abdominal Tumours. It is only by repeated and careful examination that mistakes can be avoided in the diagnosis of abdominal tumours. The same methods are adopted here as in general enlargement (§§ 241, 257). (1) *Inspection* in the recumbent, and sometimes in the erect, posture *should never be omitted*; (2) *Palpation* to determine its size, position, borders, mobility and texture. This requires a flat hand previously warmed and with the patient's abdominal muscles thoroughly relaxed by a suitable posture; (3) *Percussion*, to define the resonance or dulness of the tumour; (4) *Careful Measurement* made and

recorded, both for the comparison of one part with another, and to note the progress made by the growth; (5) *Auscultation*, which is especially useful in the diagnosis of late pregnancy; and (6) *Examination under an anæsthetic* is sometimes required.

Fallacies of Abdominal Tumours.—(1) *Obesity* may offer a serious obstacle to the examination of abdominal enlargements or tumours. In these cases the umbilicus is usually depressed. The only way to arrive at a correct decision is to place the hand flat upon the abdomen and then dip the fingers suddenly and forcibly inwards.

(2) The presence of *fluid* within the abdomen, together with a solid tumour, may prevent our discovering or examining the latter thoroughly. It is best to re-examine after paracentesis has been performed.

(3) *Pregnancy* and a *distended bladder* are frequent sources of error.

(4) *Gas in the intestine* causes enlargement in the lower abdomen, with marked resonance to percussion.

(5) *Fæcal accumulations* may simulate malignant and other tumours, though they can generally be indented by the fingers. They are always situated in some part of the large bowel. Give a course of castor oil or other purgative, or repeated enemas.

(6) A "*phantom tumour*," is a swelling (usually tympanitic, sometimes dull), produced by irregular muscular contraction of one or both recti muscles, and it is wonderful how precisely it may simulate a solid tumour. It is apt to appear and disappear suddenly, hence the name. The condition is met for the most part in young hysterical women, and is usually beyond the control of the patient. It is a frequent cause of error in diagnosis. Spasm of the diaphragm may produce a generalised abdominal enlargement by pushing the viscera down. The patient should be placed in a position of perfect ease for the relaxation of all the muscles of the body, with the knees drawn up and the neck slightly bent. Sometimes an anæsthetic is required in order to establish the diagnosis.

(7) The *liver* occasionally presents an extra lobe (§ 263. I.). Displaced or movable organs may be mistaken for tumours.

Having excluded these fallacies, and being satisfied as to the existence of an abdominal tumour, there are five points to which our attention should be directed:

1. The first and most important question is the *locality of the tumour*, in which region is it situated, or where did it start?

2. To ascertain with *which organ it is connected*, consider what organs are located in the region occupied by the tumour, and then see if it be structurally continuous by palpation and percussion with one of these.

3. If it *moves with the breathing* of the patient we know that it must be connected with the diaphragm, or some organ depressed by it during respiration, such as the spleen, liver, gall-bladder, stomach, intestines, kidney, or omentum. If fixed, it is a tumour of the pancreas, aorta, lymphatic glands, or some other organ unaffected by respiration, or bound down by adhesions.

4. Inquire for a *history of any disease* or functional disturbance of the abdominal organs—*e.g.*, in the case of the kidney, whether the urine contains, or has contained, blood or pus; or perhaps there has been jaundice, pointing to hepatic mischief. Inquire also whether the tumour is constantly present or appears intermittently.

5. The diagnosis of the *nature of the tumour* depends very largely upon its history and the age and sex of the patient. Tense cystic tumours are extremely difficult to differentiate from solid growths, but we can try to obtain the percussion and fluctuation tests (§ 259). There is also another question which very frequently presents itself for consideration—*viz.*, is the tumour benign or malignant? The general symptoms of malignant disease (cancer) are discussed in § 555; but the age of the patient, and the rapid course and lethal tendencies of the disease, are the chief means of differentiating it.

§ 263. *If there is a visible or palpable tumour, in the abdomen, ascertain which REGION the tumour chiefly OCCUPIES or ORIGINATED in, and refer to that region in the following summary. Having identified ITS ORIGIN in this way, reference must be made to the diseases of the organ affected to ascertain the NATURE of the tumour.*

I. RIGHT HYPOCHONDRIUM.—The commonest tumours in this position are tumours of the *liver*, especially cancer and enlargement of the organ. The features which HEPATIC TUMOURS present in common, in addition to their position, are: (1) They are not covered in front by resonant bowel, and their dulness is continuous with that of the liver; (2) they move with respiration; and (3) there are ascites, jaundice, or other evidences of liver derangement. It must not be forgotten that hepatic tumours may be simulated when the liver is pushed down by pleural, pericardial or subphrenic effusions; or that it may be puckered by contraction of the capsule, and so simulate a tumour or enlargement (Diagnosis of Hepatic Enlargements, § 343 *et seq.*); Riedel's lobe (see below) is another fallacy. A distended GALL-BLADDER (*e.g.*, by cholecystitis) is recognisable as a tense pear-shaped swelling below the ninth costal cartilage. There is only occasionally a history of biliary colic but often a history of "chills" (biliary fever, § 354). It is distinguished from the kidney by the fact that the colon passes over the kidney. Tumours in this region may also be connected with the *duodenum* or *right kidney* (see II. and IV.).

Riedel's Lobe of the Liver.—In certain cases, sometimes associated with gall-stones retained within the gall-bladder, a tongue-shaped process projects downwards from the right lobe of the liver. It may reach as far as the iliac crest, or even to the iliac fossa. In hardly any of the cases has the condition been correctly diagnosed before operation. It has most often been mistaken for floating kidney, and has also been taken for distended gall-bladder, hydatid cyst, renal or omental tumour. It is sometimes tender, its shape more or less that of a pear. Under anæsthesia its connection with the liver may possibly be made out. By X-ray its shadow may obscure the pyelogram of a normal right renal pelvis, leading to the mistaken diagnosis of renal tumour.

Suprarenal Tumours become manifest in the right or left hypochondrium, and are difficult to distinguish from tumours of the liver, gall-bladder, kidney and spleen

respectively. The symptoms consist of: (i.) Pain radiating across the abdomen and to the back; (ii.) pain referred to the shoulder tip; (iii.) emaciation, with nervous depression, and digestive disturbance; (iv.) a tumour felt beneath the costal margin, at first movable with respiration, but soon becoming fixed; it can be felt posteriorly in the costo-vertebral angle; (v.) absence of urinary and gall-bladder symptoms. Early diagnosis is aided by excretion urography, the tumour depressing the corresponding kidney and giving filling defects in the renal pelvis. The injection of air into the loin, followed by a skiagram, has also revealed tumours of the adrenal—a procedure to be undertaken only by experts.

Suprarenal Tumours arise in the medulla and in the cortex. The important *medullary* tumours are (a) the pheochromocytoma which is associated with hypertensive properties, and (b) the neuroblastomata. The latter arises chiefly in children; a striking feature is their extensive metastases. In the *Hutchinson syndrome* they arise in the left adrenal and form metastases in bones, especially the ribs, skull, lungs and liver; exophthalmos and ecchymosis of the left eye may be the first sign. In the *Pepper syndrome* the tumour arises in the right adrenal; metastases occur mainly in the liver and become enormous. *Cortical* tumours cause local pressure effects; some lead to sexual manifestations; in children, precocious growth and sexual development, which must be distinguished from similar conditions due to hypothalamic tumours. In female adults, carcinoma of the adrenal may give rise to symptoms similar to Cushing's disease; in male adults, signs of feminism may develop. Adrenal hyperplasia (bilateral) is associated with *virilism*, which is more marked when symptoms arise before than after puberty. There is a general masculinisation of the female: hirsuties, muscular development, changes in voice, and diminished female characters, *e.g.*, deficient mammary glands, amenorrhœa, either primary or secondary, or other menstrual disturbances: such tumours are characterised by a positive Ponceau-Fuchsin staining reaction (Vines).

II. In the **EPIGASTRIC REGION** tumours may be connected with the liver (*vide supra*); but the first tumour which would occur to one's mind would be **CANCER OF THE STOMACH**—*i.e.*, a hard, irregular swelling attended by vomiting, "coffee-ground" in character. The commonest form of malignant disease of the stomach, however, is scirrhus of the pylorus, in which visible peristalsis, copious vomiting at long intervals, and other gastric symptoms appear before any swelling can be detected (§ 294).

Pancreatic cysts may cause a fluctuating swelling in the epigastrium, but their detection is extremely difficult. There may be a history of pain, and symptoms of pancreatic disease (see § 256). Cysts of the *small omental sac* present a similar swelling. *Pulsation in the epigastrium* may be due to hypertrophied right ventricle but is usually normal; rarely it is caused by abdominal aneurysm.

III. In the **LEFT HYPOCHONDRIUM** tumours of the **SPLEEN** originate and sometimes attain an enormous size (§ 357). They move with respiration, and they make their way forward in *front* of the colon towards the umbilicus. A splenic tumour can generally be moved forwards by getting the hand behind it, a fact which distinguishes it from tumour of the left kidney, and it presents the characteristic splenic notch. It resembles tumour of the left lobe of the liver, but the latter cannot be displaced downwards by the hand. Other tumours in this position may be connected with the *stomach, pancreas, liver, kidney, and sigmoid flexure*.

IV. The **LUMBAR REGION** may be the starting place for **RENAL TUMOURS**, which are characterised by four features: (i.) Their comparative fixity during respiration. (ii.) Dulness in one flank, and, unless both

kidneys are involved, resonance in the other. (iii.) They are *always resonant in front*, because as they make their way forwards and downwards they push the colon in front of them; and (iv.) there is no resonant part between the dulness of a renal tumour and the spine, as there would be in the case of a splenic tumour. In many the rounded and reniform shape of the kidney is retained. They are distinguished from hepatic tumours by the dulness in the flank not being continuous with that of the liver, and by the presence or history of blood, pus, or other urinary changes. The commoner forms of renal tumours are hydro- and pyonephrosis, congenital cystic kidney, renal sarcoma (commonest tumour in children), and perinephric abscess. A perinephric abscess tends to point backwards. *Pyo- or Hydronephrosis* are cystic tumours, containing urine *with or without* pus respectively (§ 424). Hydronephrosis may be almost painless, not tender, and unattended by subjective or constitutional symptoms; pyonephrosis is always tender, and attended by hectic fever (unless the abscess is chronic). Hydatid of the kidney may only be evidenced by swelling; sometimes it gives a thrill on percussion. Other tumours starting in the lumbar regions may be connected with the *ascending and descending colon*.

Movable or Floating Kidney is one of the most frequent of abdominal tumours, especially on the right side. It descends with inspiration, slips back into position during expiration, and may be found as low as the iliac fossa. Its mobility and rounded or reniform shape, are characteristic, but not always easily detected. There is a characteristic pain of a dull, aching, or dragging character in the back, increased by exertion (see § 253).

V. The LEFT ILIAC REGION may be the seat of a tumour caused by CANCER of the SIGMOID FLEXURE, and this is the most frequent position in the bowel for cancerous growth. Cancer and other *tumours of the large intestines* are distinguished generally by their free mobility (unless fixed by adhesions). They are, when cancerous (far the commonest neoplasm of the intestines), attended by irregularity of the bowels, generally alternating constipation and diarrhœa. The commonest starting-point for primary cancer of the bowel is the sigmoid flexure; but before a cancerous swelling can be detected in the left iliac region the patient will have been troubled with recurrent diarrhœa and pain, sometimes melæna. These symptoms are followed in course of time by œdema of the leg or sciatica. In *cancer* of the peritoneum the intestines may become matted together, and although fluctuation may be detected, there may be little fluid in the peritoneal cavity. Sarcoma of the *small intestines* is rare and usually only diagnosed by laparotomy. The prognosis of cancer is given in Chapter XVI. So-called "colloid cancer" of the peritoneum is a remarkable exception in regard to duration of life; it may last for years. Treatment is not very hopeful. See "Emaciation." While diverticulosis may occur in any part of the alimentary canal, *diverticulitis* may show a swelling due to adhesive peri-diverticulitis or abscess formation which is difficult to distinguish from cancer. (See § 321.)

VI. The RIGHT ILIAC REGION is the position in which APPENDICITIS

is usually manifested; it is fully described under "Abdominal Pain" (§ 249). *Intussusception* of the bowel, which occurs mostly in childhood, generally arises in this region, but the tumour is most commonly felt under the liver (§ 319). *Pelvic peritonitis* may form a firm swelling in either iliac region. Its other features are (i.) vaginal examination reveals a tender swelling in the corresponding fornix, pushing the uterus to the opposite side; (ii.) there is a history of acute pain and fever at the onset, frequently following childbirth or abortion. *Gumma, tubercle* and *cancer of the cæcum*, contrary to what we might expect, often constitute a *movable* tumour in the iliac region, and are apt to be mistaken for a mass of fæces. Cancer or *actinomycosis* of the cæcum may be attended by suppuration, so giving rise to abscess with pyrexia. The history of such cases may run a long course, and resemble appendicitis. Enlarged *glands* and *Crohn's disease* may be mistaken for appendicitis. *Iliac abscess* in Pott's disease may point in this region. A right movable kidney may simulate a tumour.

VII. The UMBILICAL REGION is the starting place of tumours connected with the pancreas, duodenum, mesenteric glands, and aorta, all of which are *immobile during respiration*; though a tumour in this position is far more often connected with the stomach, liver, or transverse colon, which *move with respiration*. Enlargement of the *mesenteric glands* may be sometimes detected in spare subjects by grasping the two sides of the abdomen either between the two hands or the finger and thumb of one hand. When large enough to form a tumour, they are fixed and matted together.

Aneurysm of the Abdominal Aorta is a pulsatile and expansile swelling, immobile during respiration. In thin subjects a thrill may be felt, and a murmur heard. In auscultating the abdominal aorta we must be careful not to produce a murmur by pressure of the stethoscope. It is attended always by a severe fixed neuralgic pain in the spine, and sooner or later breathlessness and cardiac signs. It is these latter symptoms which distinguish true aneurysm from "pulsatile aorta" (see below), and from a swelling in front of the vessel to which the pulsation has been communicated. An endeavour should be made to grasp the swelling on each side, so as to confirm the expansile nature of the tumour.

Pulsating Abdominal Aorta (throbbing in the belly).—Dyspeptic subjects and nervous females are often troubled with marked pulsation of the abdominal aorta, which is sometimes obvious both to the patient and the doctor. There is in this affection great local discomfort, and even pain, with marked pulsation, obvious to both inspection and palpation. The diagnosis from aneurysm rests partly on the fact that the pulsation is not limited to any part of the aorta, and partly, that such rapid and violent action of the heart is not common in aneurysm.

VIII. The HYPOGASTRIC REGION is the situation whence BLADDER, UTERINE, OVARIAN and TUBAL TUMOURS grow. *Ovarian tumours* (which are nearly always cystic) are usually characterised in the *early stages* by their free mobility, unless they are malignant, and their rapid growth (§ 261). *Tumours of the bladder* are usually rendered sufficiently obvious by changes in the urine and by passing a catheter. *Tumours of the uterus* are similarly revealed by uterine symptoms, excepting perhaps some subperitoneal fibroids. These may reach a large size without any

symptoms at all; their origin and relations are detected by bimanual examination. *Pregnancy* causes a symmetrical enlargement, starting from the hypogastric region about the third month of gestation. Among the rarer tumours are pelvic hydatid and pelvic hæmatocele.

The NATURE, PROGNOSIS, and TREATMENT of these various abdominal tumours are discussed under the organs with which they are connected.

§ 264. **Flattening or Recession of the Abdomen** is not a sign of any great importance. "Ventre plat, enfant il y a," is a French expression signifying that the abdominal wall slightly recedes during the first two or three months of pregnancy. It is met with in abstinence from food, and in wasting disorders, such as with dehydration, cancer and tubercle. It may be present also in intestinal, hepatic, and renal colic, and as a consequence of excessive purging or vomiting. A hollow or "boat-shaped" abdomen is often characteristic of meningitis in infants. It may also occur when acute general peritonitis is present, especially in children.

CHAPTER X

THE STOMACH

It is to be noted that the alimentary tract, apart from the mouth, pharynx and rectum, is not subject to direct examination by ordinary methods. Much progress has followed the use of test meals (§ 279) and examination by X-ray; and in expert hands the œsophagus and stomach, and the sigmoid may be brought into direct vision by œsophagoscopy, gastroscopy and sigmoidoscopy. In ordinary practice we are largely dependent upon subjective symptoms in the investigation of disorders of the stomach. However, the patient's sensations before and after meals are not necessarily related to his stomach, for gastric symptoms are frequently not of gastric origin, but associated with disease of the heart, kidney, lungs, gall-bladder, duodenum, appendix or internal secretory glands. On the other hand, derangements of the stomach produce widespread effects in the general economy. The nutrition, of course, fails; but, apart from this, sufferers from gastric disorders are liable to prostration and depression. In chronic disorders of the stomach the functions of the nervous system may be so profoundly disturbed by neurasthenic and other symptoms that the physician may overlook the primary cause of the mischief—namely, mal-assimilation of food. The stomach and digestion are influenced by two sets of nerves—the sympathetic and vagus; their relationship and equilibrium may be disturbed by (1) reflex conditions, (2) asthenia of the nervous system, (3) endocrine secretions, and (4) emotions.

PART A. SYMPTOMATOLOGY

The symptoms which reveal disorders of the stomach may be **local** (viz., epigastric pain or discomfort, nausea or vomiting, hæmatemesis, dryness or bad taste in the mouth, thirst, flatulence, heartburn, hiccough, water-brash, altered appetite); or **general** and **remote** (viz., cardiac symptoms, various nervous derangements, skin symptoms, and emaciation).

Among the **Local Symptoms** of gastric disorder, PAIN OR DISCOMFORT AFTER FOOD, and NAUSEA OR VOMITING, are the most constant and important—*i.e.*, the cardinal symptoms. HÆMATEMESIS is less frequent, but more serious. Other local symptoms are also of value in diagnosis.

§ 270. **Gastric Pain**, or discomfort, in diseases of the stomach, is a most important *local* feature. Although it is not in every case sufficiently constant in its characters to enable us to establish the diagnosis, nevertheless it merits the closest study. In some cases it is altogether absent (even when simple ulcer or malignant disease exists), but when present,

the features which should be noted are its *position*, its *character*, its *degree*, its *constancy*, and above all, its *relation to the taking of food*.

Its *Position* is usually over the epigastrium, but pain is very frequently complained of between the shoulders, and very severe pain in the back may also occur. A localised pain with tenderness occurs with ulcer. In its *character* it varies considerably. Sometimes it is like a dull weight or a feeling of distension, such as occurs in nervous dyspepsia and chronic gastritis; or it may be of a burning character, as in hyperchlorhydria; or it may resemble abdominal cramp, as in spasm of the pylorus (§ 246), or in some cases of nervous dyspepsia. Sharp or lancinating pain of a persistent character usually attends ulcer or cancer of the stomach.

Its *Relation to Food* is by far the most important feature of the pain in gastric diseases: (a) *It comes on at once* and lasts a variable time in nervous (atonic) dyspepsia, in acute and chronic gastritis and in ulcer (simple or malignant). /In simple ulcer pain may come on soon or as long as two hours after the meal, varying with the site of the ulcer; the pain is at once relieved by vomiting—a characteristic feature; and solids usually give more pain than liquids. In gastric ulcer the sequence generally is food, ease, pain, ease till food is taken again. (b) When pain *comes on an hour or more after food*, it is due to excessive acidity, either from hypersecretion or fermentation (organic acids). In hypersecretion, pain is relieved by taking food and alkalies. Pain coming on late after food is common in duodenal ulcer (hunger pain), and the sequence tends to be food, ease, pain lasting until the next meal. A similar pain may be caused by chronic appendicitis or gall-stones. (c) Pain *coming on without time relation to food* is characteristic of nervous dyspepsia, and is met with in carcinoma of the stomach. If deep pressure *over the seat of pain* relieves it, the condition is probably functional, not organic.

Fallacies.—Pain of the acute type may be mistaken for *biliary colic*, but in that condition the pain is greater on the right side, and is sometimes followed by jaundice. In *hepatic* disorders, pain is more often limited to the right hypochondrium. The spine should always be examined for *caries*, especially when stomach pain is complained of by children. The pain in such cases is referred to the terminations of the intercostal nerves. The gastric crises of *tabes dorsalis* may be mistaken for simple gastritis. Pain in the *chest* (§ 33) must not be mistaken for abdominal pain. *Diaphragmatic hernia* (§ 109) and other causes of *dysphagia* must be thought of. *True angina pectoris* and *coronary thrombosis* might be mistaken for that type of dyspepsia in which the stomach is distended with gas and hampers the heart's action. In acute *pancreatitis* there is extreme pain of sudden onset in the left hypochondrium, and the case usually terminates fatally in a few days (§ 245). Other pancreatic diseases are also attended by pain in the situation of the stomach.

§ 271. **Nausea or Vomiting** is, after pain, the most frequent and most definite symptom of stomach disorders. Its causes may be grouped under three headings: (a) Local, (b) Nervous, and (c) Toxic. Waterbrash

(§ 273) is sometimes spoken of by the laity as "vomiting," but is not true vomiting. Regurgitation from a dilated œsophagus or œsophageal pouch is another fallacy; the food returns easily and is not acid in reaction. Prolonged coughing may induce vomiting; patients may complain of vomiting, and the physician may be led in consequence to treat the stomach instead of the lungs.

(a) LOCAL CAUSES of vomiting include: (1) *Errors of diet*, such as shell-fish, infected food, excess of alcoholic, fatty, and other irritating foods. Under these circumstances the vomiting of the peccant material occurs soon after ingestion. (2) *Irritant and corrosive poisons* and *emetics* also speedily give rise to vomiting. The diagnosis of this cause is aided by (i.) an examination of the vomit, which should *always be preserved*; it may smell of phosphorus (which is luminous in the dark), or of carbolic, or other acids. (ii.) An examination of the mouth for any corrosive action. (iii.) The occurrence later of the toxic effects peculiar to the several poisons; and (iv.) a history of poisoning obtained from the patient or his friends. (3) *Fermentation* of the contents of the stomach, such as that met with in dilatation due to pyloric obstruction, when the vomiting may occur at very considerable intervals, sometimes of a day or two; the vomited matter is copious, frothy, and contains sarcinæ and yeasts. (4) *Diseases* such as acute gastritis, cancer, and simple ulcer are usually accompanied by vomiting. In chronic gastritis of alcoholic origin mucus is vomited chiefly in the early morning. (5) *Acute dilatation of the stomach* may come on more or less suddenly in early life, or in states of general weakness and toxæmia, as after operation or in pneumonia, with repeated vomiting and symptoms of collapse, resembling intestinal obstruction. It is a serious condition, often fatal unless relieved by continuous gastric suction.

(6) *Acute duodenal ileus*, an obstructive condition of the third part of the duodenum due to compression by the superior mesenteric vessels, occurs with dilatation of the stomach, profuse vomiting, epigastric distension, and later severe prostration. It must be treated on the same lines as acute dilatation of the stomach, with continuous gastric suction by a tube left in the stomach, and with the foot of the bed raised. (See also § 319, IV.)

(7) Persistent vomiting and marasmus in young infants are the two chief symptoms of **Congenital Hypertrophic Stenosis of the Pylorus**. The symptoms commonly begin about the end of the second week of life—(i.) projectile vomiting, which cannot be stopped; (ii.) progressive emaciation; (iii.) constipation; and later (iv.) visible peristalsis of the stomach. (v.) A small hard nodule (the hypertrophied pylorus) may be palpated under the upper part of the right rectus. Careful feeding, lavage, and methyl atropin nitrate (eumydrin), beginning with 0.5 c.c. and increasing by 0.5 c.c. to 2.5–3.0 c.c. of 1/10,000 solution half an hour before meals q.i.d., often effect a cure. Toxic symptoms, such as abdominal distension, bouts of fever, dilatation of the pupils, indicate a reduced dose. Rammstedt's operation gives good results, but it must not be left as a last resource.

(b) VOMITING OF NERVOUS ORIGIN may be classified under two groups—cerebral and reflex.

That due to a CEREBRAL CONDITION. 1. *Hysterical Vomiting* may

follow any or every kind of food, no matter what its quantity or quality may be ; or perhaps digestible articles like milk will cause vomiting, while indigestible foods like pickles may be retained. Sometimes this vomiting resembles a simple regurgitation or possetting, as compared with the urgent vomiting of organic disease, the symptoms of which are wanting.

2. In *Migraine* and *Bilious Headache* the patient perhaps awakens with a headache, and vomits only mucus and bile (merely an indication that the vomiting is urgent, or that the stomach is empty).

3. Another important cause of vomiting is *Organic Cerebral Disease* (§ 827)—*e.g.*, tumour, early meningitis, abscess, Ménière's disease. This is recognised by: (i.) The vomiting occurs without relation to food; (ii.) it is urgent and projectile; (iii.) there may not be nausea; (iv.) the vomiting may be excited by simple change of posture; (v.) the presence of other cerebral symptoms, such as vertigo and perhaps optic neuritis (§ 850). Vomiting may also attend the gastric "crises" of *locomotor ataxy*. It occurs at intervals, and is usually severe. It is recognised by the absence of the ankle and knee jerks and the presence of other symptoms of the disease (§ 817). Vomiting may be associated with *glaucoma* (§ 855), which is easily overlooked.

4. *Mountain* and *aviator's sickness* is due to *anoxæmia*.

REFLEX VOMITING from *visceral irritation* may be met in a great many abdominal disorders, such as peritonitis, pancreatitis, intestinal, biliary, or renal colic; in all stages of intestinal obstruction, in strangulated hernia, and with intestinal new growths. In the last named the attention of the physician is often drawn from the true source of trouble. It occurs also with pregnancy, uterine and ovarian disorders. Pharyngeal irritation, especially in alcoholics and smokers, leads to prolonged hawking often followed by vomiting.

(c) TOXIC CAUSES are uræmia and jaundice and the onset of some of the acute specific fevers. The vomiting of Addison's disease, hyperthyroidism, and pernicious anæmia comes under this heading. Certain cases of vomiting in pregnancy are due to toxæmia. After anæsthetics vomiting may be urgent; sometimes this is due to blood in the stomach, and will cease when it is expelled or washed out.

The *Treatment* of vomiting must be directed to its cause, but there are certain measures which can be applied to relieve the symptom. The patient should be kept at rest in the horizontal position, and without food, or only given milk in small quantities at a time, and iced water. Milk diluted with barley-water, whey, or citrated milk are given where ordinary milk is not retained. Among the remedies which may be employed are effervescing mixtures, alkalies, hydrocyanic acid, bismuth, minim doses of ipecacuanha or liq. iodi (in a teaspoonful of water), opium, and acetanilide (especially in the vomiting after anæsthetics), sod. bicarb. gr. 60 to Oi water, seidlitz powder (if the vomiting be due to constipation) or calomel. In some cases champagne is helpful. Bromides and valerian aid nervous vomiting; a mustard-leaf applied to the epigastrium.

may also be useful. Washing out the stomach with warm water or normal salt solution often gives relief, especially in acute dilatation. For *Sea-sickness*, navi-gan, cafinal, chloretone and hyoscine gr. $\frac{1}{100}$ by mouth are recommended.

Cyclical or Recurrent Vomiting, "acidosis," is a not uncommon condition in children. The attacks may occur at regular intervals of 2, 4 or 8 weeks. Predisposing causes: (i.) there is often a family history of the same condition or of allergy or migraine; (ii.) thin, highly-strung, lordotic children are much more susceptible. Precipitating causes: (i.) constipation, over-eating of fatty foods, eggs, chocolates; (ii.) over-fatigue, excitement, over-strain at school, riding in cars and trains; (iii.) the onset of any infection, commonly in the throat or at the onset of one of the specific fevers; when arising in the appendix the differential diagnosis may be difficult and a surgeon should be consulted. The condition is associated with defective function of the liver. An attack comes on suddenly, with headache, pallor, repeated vomiting and retching, followed by abdominal pain, some pyrexia, drowsiness, and if the vomiting persists, dehydration and a rapid thready pulse; the breath smells sweet from the presence of acetone, and acetone and diacetic acid are found in the urine (Ketosis, § 384). Cases have been mistaken for meningitis and for acute abdominal conditions.

Treatment.—The child should be kept at rest in a darkened room, and the bowels freed with grey powder or an enema. Frequent small sips of glucose in water or in a fruit drink (1–2 oz. to 1 pint) must be given by mouth, with small doses of alkaline carbonates and citrates. In severe cases rectal or intravenous glucose may have to be used. Any associated infection must be treated. To prevent attacks, the above-mentioned predisposing conditions must be dealt with.

§ 272. **Hæmatemesis** (Vomiting of Blood).—Bleeding from the stomach, unless in slight quantity, is usually accompanied by nausea and vomiting. In the first place, it is important to decide whether the blood really comes from the stomach and œsophagus.

Sources of Fallacy.—(1) Blood from the *lungs* may be mistaken for blood from the stomach (see Hæmoptysis, § 104). (2) *Epistaxis*, the blood running down the gullet and being vomited, is a common fallacy in children, in whom the blood is apt to be swallowed. This may follow operations on the tonsils or teeth. Epistaxis is recognised by making the patient blow his nose: there are no abdominal symptoms. (3) Blood from the *fauces* or *gums*, especially when the gums are spongy, or when pyorrhœa alveolaris exists, may give rise to a sanguineous vomiting or expectoration, the cause of which is very apt to be overlooked even by competent observers; but the blood is mixed with saliva, and is rarely large in amount. (4) Blood from a fracture of the base of the skull and from œsophageal disease may also be swallowed and vomited. On the other hand, *hæmorrhage from the stomach* is (i.) preceded by a feeling of faintness and nausea, and (ii.) followed by melæna (tarry stools).

(iii.) Blood from the stomach is mixed with food, and mostly brown ("coffee-grounds"), though it may be red if the quantity is large (*e.g.*, in ulcer) or if food has been brought up before the blood. (iv.) There is no history or local sign of pulmonary disease, and there may be a previous history of disease or derangement of the stomach or liver.

The *Causes of Hæmatemesis* may be roughly divided into (a) those which produce a slight or protracted hæmorrhage, and (b) those which give rise to a large quantity at one time.

(a) **Slight or Protracted Hæmorrhage** occurs chiefly in Chronic Gastritis and Cancer. A temporary irritation or congestion of the stomach produced by irritating articles in the food or by urgent vomiting (*e.g.*, with migraine), may be attended by *streaks* of blood in the vomit. A smaller hæmorrhage may occur in cases described in group (b) below.

I. CHRONIC GASTRITIS is known by (i.) vomiting in the morning—often viscid mucus streaked with blood—or at other times. (ii.) It may be accompanied by, and due to, disease of the liver (cirrhosis), or advanced cardiac disease, and is found especially in alcoholic subjects (see § 284): syphilis is a rare cause.

II. CANCER OF THE STOMACH OR ŒSOPHAGUS is recognised by: (i.) The patient is usually beyond middle age; (ii.) pain is complained of—severe, constant, and generally worse after food; (iii.) the blood vomited is rarely copious, but typically "coffee-ground" in character, and may recur for weeks; (iv.) the hæmatemesis is followed by melæna unless the blood is scanty, and occult blood is usually present in the fæces; (v.) there is progressive cachexia; (vi.) an abdominal tumour or evidence of cancer elsewhere, *may* be found (see also § 294).

(b) A **Large Hæmorrhage** at one time may occur in Ulcer of the Stomach or Duodenum, Portal Cirrhosis of the Liver, Splenic Anæmia, Gastrostaxis, Purpura, Chronic Nephritis, or after taking Chemical Irritants.

III. PEPTIC ULCER, OF THE STOMACH OR DUODENUM, OR OF THE JEJUNUM AFTER GASTROENTEROSTOMY.—(i.) The bleeding is copious, the vomit is often bright red, after being brown at first, and melæna follows; (ii.) there is usually a history of indigestion, sometimes of operation; but hæmatemesis may occur in the previously healthy.

IV. ATROPHIC CIRRHOSIS of the liver (by causing portal obstruction) (§ 342). The hæmatemesis may be slight, but it is more often very copious—the most copious met with, as it is of venous origin, from ulceration of varices of the lower œsophagus.

V. OTHER CAUSES OF PORTAL OBSTRUCTION (see § 260)—*e.g.*, tumour pressing on the portal vein. This, as with cirrhosis, is known by the other symptoms of such disease—*e.g.*, increasing ascites, splenic enlargement, jaundice, and diarrhœa. Thrombosis of the portal vein is rare and hard to diagnose. It gives rise to sudden onset of signs of portal obstruction.

VI. ANEURYSM OF THE AORTA, or of one of its branches, leaking into the œsophagus or third part of the duodenum. This is known by (i.)

possibly a previous history of aneurysmal symptoms (§ 80); (ii.) the blood is copious; (iii.) sudden death usually occurs; but in certain other cases there is a small recurrent leakage from the aneurysm for a few days or weeks preceding death.

VII. GASTROSTAXIS.—Under this title are included cases of hæmatemesis, occurring usually in young anæmic women, due to capillary oozing. Such cases were formerly thought to be due to gastric ulceration, but more frequent operations and post-mortem examinations have shown that no ulcer is present. Hypertrophic gastritis may be seen with the gastroscope.

VIII. MORBID CONDITIONS OF THE BLOOD, such as nephritis, yellow fever, malignant forms of the specific fevers, purpura, leukæmia, and hæmophilia.

IX. SPLENIC ENLARGEMENT in the early stage of splenic anæmia, even before the liver is involved.

X. CHEMICAL IRRITANTS (*e.g.*, arsenic, strong alkalies, and mineral acids), or mechanical injuries from articles which have been swallowed. In susceptible individuals acetylsalicylic acid (aspirin) can produce an acute gastric erosion, especially if swallowed in small lumps which lodge between folds of mucous membrane.

In the *Differentiation* of the causes of hæmatemesis (1) examine the stomach and duodenum for ulcer; (2) examine the liver, especially for cirrhosis; (3) examine the chest for aneurysm or other mediastinal growths which may have perforated the œsophagus; (4) ascertain the approximate quantity of vomited blood, and then review the case, remembering the possibility of simulation in neurosis.

Prognosis.—Hæmatemesis is usually a serious symptom, but its gravity depends upon the cause. As regards the lesion, aneurysm is the most grave of the causal conditions; then, in order, cancer, morbid blood states, cirrhosis, and peptic ulcer. In chronic ulcer of the stomach and duodenum the mortality from hæmatemesis may be 10 per cent. Grave prognostic signs are marked pallor, air hunger, rapid thready pulse, and repeated vomiting or melæna.

Treatment.—The indications are: (i.) to stop the hæmorrhage. The patient must be kept absolutely at rest in the horizontal position. An ice bag should be placed over the epigastrium. Morphia hypodermically is the best hæmostatic and relieves anxiety: it must be repeated to allay restlessness. Thromboplastin or calcium salts may be injected. Adrenalin 30–60 min. in 1 oz. ice-cold water by mouth, repeated each 1–2 hours, is the best local hæmostatic. (ii.) To combat shock and allay distressing thirst, rectal glucose-salines and axillary salines are essential. In profuse hæmorrhage, when shock is severe, blood transfusion by the drip method is necessary. Intravenous gum-saline should only be used if blood is not available. The fall in hæmoglobin of the blood is not a good measure of the necessity for transfusion, since in acute hæmorrhage, although the blood volume falls, dilution of the blood by absorption of tissue fluids occurs later. It is inadvisable to give more than 2 pints of blood at a time for

fear of restarting the hæmorrhage. (iii.) By the mouth nothing is given until 24 hours after major bleeding has ceased: some allow sips of iced water or ice wrapped in muslin to be sucked. Then iced citrated milk may be started. Meulengracht has advised much more liberal feeding (§ 297. III); and some give 3 pints of citrated milk each 24 hours to prevent starvation and dehydration and to keep gastric acidity low. Opinions still differ as to which method is preferable. (iv.) Aperients or enemas must never be given until after the lapse of several days. Liquid paraffin by mouth or rectal washouts are permissible. (v.) General treatment must include scrupulous care in the toilet of the mouth, to prevent parotitis, and the subsequent administration of iron. (vi.) If hæmorrhage recurs in spite of treatment, surgical treatment is probably advisable.

§ 273. The **other Local Symptoms** of gastric disorder are of considerable diagnostic value.

1. **BAD TASTE IN THE MOUTH**, most noticeable in the morning, and **DRYNESS OF THE LIPS** are often complained of in gastric disorders. Sleeping with the mouth open must be excluded.

2. **HALITOSIS** (foul breath) may be due to bronchiectasis: recent work suggests the importance of the absorption via the small intestine of offensive volatile products of fat digestion—a condition cured by reducing the fat intake to 40–60 G. a day. A *tainted breath* may also be due to dental caries, pyorrhœa and septic tonsils (and see § 201).

3. **THIRST** occurs in dyspeptic conditions with acute dilatation of the stomach, inflammatory stomach lesions, and in all cases of persistent vomiting.

4. **FLATULENCE** is a distension of the stomach or intestines by gas, which may be brought up by the mouth or passed by rectum.

Symptoms.—Flatulence causes *local* symptoms of discomfort and distension, and *remote* symptoms such as palpitation and cardiac irregularity.

Etiology.—Gastric flatulence is a common symptom in chronic gastritis, gall-bladder dyspepsia, and in some nervous individuals without gastric derangement in whom there is repeated swallowing of air and subsequent “belching” of gas. Intestinal flatulence may be the result of swallowed air, of excessive fermentation of starches and sugars, and of constipation or diarrhœa; paralytic ileus, coeliac disease and sprue give a flatulent distension of the abdomen often without any complaint from the patient.

Treatment necessitates removing the cause. Carminatives such as brandy, spir. ammon. aromat., ginger, peppermint and phenol may aid: magnesia helps the flow of bile as well as emptying the small and large intestines, and so Gregory's powder is particularly helpful. Charcoal aids intestinal flatulence.

5. “**HEARTBURN**” and **ACID ERUCTATIONS** are usually met with together. Heartburn is a burning sensation passing up from the epigastrium to the pharynx, and sometimes mouthfuls of acid fluid are brought up at the same time. It is due to superacidity and partial regurgitation of the gastric contents into the lower end of the œsophagus.

Causes.—Superacidity, or “acid risings,” may be of two kinds. (a) *Organic acids* are met with in diseases where there is *deficient* gastric secretion—some forms of atonic dyspepsia, chronic gastritis, cancer, and dilatation of the stomach. HCl is a germicide, and when from any cause it is absent, bacteria flourish; fermentation ensues within a *few hours* after food, and is accompanied by pain in the epigastrium. The three principal acids are: butyric, lactic, and acetic.

(b) Hyperchlorhydria, or *excessive secretion of HCl*, is met with in one form of acute dyspepsia, and is usually present with duodenal ulcer. Here, the pain or “gnawing” occurs *before* meals, and is temporarily relieved by food (see also § 285).

(c) In pregnancy it may be a persistent symptom, and is often relieved by acid hydrochlor. dil. 15 ℥., spir. chlorof. 10 ℥. in water after food.

The *treatment* of 3 and 4 is discussed in § 285.

6. HICCUGH.—Normally the opening of the glottis synchronises with the contraction of the diaphragm, and consequently there is no hindrance to the free entry of air. Hiccough is caused by a spasm of the diaphragm which occurs at irregular intervals and sometimes at the moment of closure of the glottic aperture. The characteristic cough is then heard. The important causes of persistent hiccough are: (1) Reflex stimulation of the phrenic nerves by gastric or colonic flatulent distension or irritation after hot, peppery foods and with hepatic disease. (2) Irritation of the peritoneum, as in peritonitis, general or local, near an inflamed abdominal organ, or in typhoid fever. (3) Disease of the thoracic viscera, especially diaphragmatic pleurisy. (4) Toxic blood states, notably uræmia. (5) Neurosis. To this cause are assigned certain cases for which no more adequate reason is apparent. (6) Hiccough may also occur as a symptom of hysteria, of cerebral tumour and meningitis. *Encephalitis Lethargica* may show itself first with persistent hiccough. (7) Persistent hiccough may also arise from central or peripheral irritation of the phrenic nerve by spinal tumours. (8) EPIDEMIC HICCUGH, probably an infection of the central nervous system, clears up spontaneously, without sequelæ. Severe cases should have morphine, when the hiccough prevents sleep. The patients are usually intensely alarmed and need reassurance.

Prognosis.—Hiccough is not as a rule a serious symptom. In abdominal disease it is of grave import. In the terminal stages of uræmia, meningitis, or cerebral tumour, persistent hiccough may herald exitus. Epidemic hiccough may resist all treatment; it exhausts the patient, and may be the immediate cause of death.

Treatment.—The simplest forms of treatment are those directed to producing definite physiological contractions of the diaphragm. These are such well-known methods as sipping water and holding the breath, or inhaling CO₂. Anything which gives rise to a feeling of suffocation may cause a forcible contraction of the diaphragm, and so stop the spasm; for this reason tickling the nares and taking snuff have been tried, often with success. The hiccough due to dyspepsia is readily cured with bicar-

bonate of soda and peppermint, and that of colonic distension, by colonic lavage. If these measures fail, or if the hiccough recurs frequently, a thorough investigation is called for. When no causal condition can be found and the hiccough continues to be severe, one may give sedative drugs by the mouth, or, if necessary, by the rectum; the bromides, the acetanilide group, amyl nitrite and tinct. opii or $\frac{1}{10}$ gr. apomorphine (subcutaneously) are successful. Peripheral stimuli, such as blisters to the epigastrium, pinching the lobe of the ear, forcible pulling forward of the tongue, and digital pressure on the vagus in the neck, may be tried; and the abdomen may be bound tightly with a bandage or with adhesive strapping. A general anæsthetic may have to be administered.

7. "WATER-BRASH" (Pyrosis) is the name given to a clear alkaline fluid expelled from the mouth in gushes, most often in the morning. Sometimes it is expelled without any kind of straining, but more often it is attended by retching. It is probably a reflex hypersecretion of saliva swallowed during the night, due to irritation in the stomach. It is met in many dyspeptic conditions, and fairly often with *peptic ulcer*.

8. ANOREXIA (Loss of Appetite) is not always an indication of stomach disease, as it is present in many general constitutional disturbances, such as infectious fevers, tuberculosis and malignant disease. Its chief clinical importance lies in its presence in the early stage of *gastric cancer*. In *cancer* and *chronic gastritis* there is sometimes no appetite before a meal or a premature feeling of fulness after a few mouthfuls. In *ulcer* there is sometimes a fear of taking food. HYSTERICAL ANOREXIA (Anorexia Nervosa) is known by: (i.) general failure of appetite or refusal to eat; (ii.) pronounced loss of weight; (iii.) constipation; (iv.) slow pulse; (v.) growth of downy hair on limbs and face; (vi.) it occurs mostly in young females, in whom there is amenorrhœa, depression and restlessness; (vii.) careful investigation reveals no organic condition (see §§ 554, 888).

INCREASED APPETITE is often met, as Shakespeare pointed out, in gastric disorders. It is found in some cases of chronic gastritis and dilated stomach, in acromegaly, pregnancy, and during convalescence. A FALSE APPETITE which is satisfied with the first few mouthfuls of food is sometimes met in subacute and chronic gastritis, owing to irritation of the mucous membrane. BULIMIA or ravenous appetite is seen in diabetes, in neuroses of the stomach, after acute gastritis, in wasting disorders such as sprue, in phthisis, intestinal worms, and Graves' disease. PERVERTED APPETITE, excessive fondness for acids and sweets, or desire to eat objects such as chalk, pencils, or hair, may occur in hysteria and pregnancy.

§ 274. **General or Remote Symptoms** are usual.

1. GENERAL MALAISE and a sense of ill-health and incapacity for work are among the earliest and most constant accompaniments of all derangements of the digestion, whether functional or organic. The dark rim beneath the eyes, and the sallow "earthy" complexion, so frequently associated with town-dwellers, are quite as often due to dyspepsia, just as this latter is often due to defective teeth or to the insufficient use of

them. EMACIATION is not common in gastric disorder, though in chronic cases there is some loss of flesh. It appears early in cancer of the stomach, and is severe in anorexia nervosa.

2. The CARDIAC SYMPTOMS met with in dyspepsia are palpitation, pain in the region of the heart (angina innocens); dyspnoea, syncope, and vertigo; intermission of the cardiac rhythm. Cough may occur, due to pharyngeal catarrh or reflex irritation. Collectively, these symptoms may give rise to the impression that the case is one of cardiac valvular disease, although the heart may be structurally healthy (Roemheld's syndrome).

3. FUNCTIONAL DISTURBANCE OF NERVOUS SYSTEM.—*Headache and depression of spirits* are frequently met in all forms of dyspepsia. A sense of general ill-health and irritability of temper out of all proportion to the local mischief attend most gastric disorders, and, where stomach symptoms are not prominent, may lead the physician away from the true cause. Many of the symptoms of *neurasthenia* may result from gastric disorder.

4. DIARRHŒA may accompany stomach disease when the gastric contents are of an irritating nature, and when achlorhydria is present (gastrogenous diarrhœa). CONSTIPATION is usually found with simple ulcer, cancer, and chronic gastritis. But a more usual condition is an IRREGULARITY of the bowels, accompanied by borborygmi (rumbling in the bowels).

5. The URINE invariably exhibits signs which reveal disturbances of metabolism. The commonest of these is an excess of URATES; in other cases PHOSPHATES and OXALATES are found. In these circumstances dyspepsia is a predisposing cause of renal and vesical calculus.

6. SKIN SYMPTOMS.—General *pruritus* may accompany some forms of gastric derangement. *Flushing* of the face after meals is met in gastric disorders, especially in women. Acne rosacea is common with dyspepsia. The face may be swollen so that the case appears like one of acute nephritis; but the sudden onset, without much constitutional disturbance, and early disappearance on curing the indigestion, distinguish it from that disease. *Urticaria* occurs in certain individuals after eating indigestible articles, and with several forms of gastric disorder (§ 609).

PART B. PHYSICAL EXAMINATION

Disorders of the stomach are investigated by Inspection, Palpation, Percussion, Auscultation, X-ray examination after an opaque meal, the Gastroscope, Examination of matters vomited or withdrawn from the stomach by a tube, by Test Meals and by Fæcal Analysis.

§ 275. **Inspection.**—(1) The *Teeth* in all cases must be closely examined. Common causes of indigestion are bolting the food, defective or absent teeth, septic tonsils and other forms of oral sepsis. See § 204 and § 209.

(2) The *Tongue* and its diseases have been described (§ 212). At one time the tongue was thought to indicate the state of the stomach, but it is a more certain indication of the patient's general condition. But

even in this, allowance has to be made for certain variations—namely: (i.) a coated tongue is normal to some, even in health, and a clean tongue in others may be associated with disease; (ii.) certain diets—*e.g.*, milk—produce a coated tongue; and (iii.) certain habits—*e.g.*, smoking and alcoholism—also coat the tongue. The mouth may show signs of poisoning by corrosive acids.

(3) Inspection of the epigastric region may reveal a tumour, or the peristaltic movements of a dilated stomach. Aortic pulsation may be transmitted by a pyloric tumour, although no bulging is visible.

(4) In skilled hands the flexible gastroscope may be employed to examine the interior surface of the stomach. Alterations in the mucous membrane, mucus secretion, hæmorrhages, ulceration or neoplasm may be demonstrated.

§ 276. **Palpation** requires considerable experience. The patient's shoulders should be supported and his arms relaxed by the sides, and he should be instructed to open his mouth, to draw up his knees, and to "let his breath go."¹ Talking to him is useful to distract his attention. The warm hand should be laid quite *flat* upon the abdominal wall. Thus one can detect the presence of a tumour, tenderness, or other abnormality. Sometimes it is helpful to have the patient supported on hands and knees, and to palpate upwards.

Gastric Succussion or *Splashing* is made out by placing one hand on each side of the stomach, and suddenly pressing inwards the finger-tips of each hand alternately: listening over the stomach at the same time with a stethoscope materially aids this sign. Otherwise it can be detected by vigorously rolling the patient from side to side. Splashing can be *normally* elicited during the process of digestion—*i.e.*, during the first hour or two after a meal, especially if much fluid has been taken. But if succussion can be elicited after that time, it suggests that there is delayed emptying of the stomach.

§ 277. **Percussion** of the stomach is not very satisfactory or precise.

Surface Anatomy of the Stomach. (Fig. 67 and § 240.) The cardiac orifice lies behind the seventh left costal cartilage $2\frac{1}{2}$ inches from the mid-line. The fundus occupies the left dome of the diaphragm and lies behind the apex of the heart. As this part of the stomach always contains gas, it is resonant (Traube's space). The body of the stomach is vertical, and turns sharply into the pyloric antrum. The pylorus lies opposite the first lumbar vertebra in the transpyloric plane just to the right of the mid-line. The greater curvature is extremely variable and depends on the state of filling; it may reach below the umbilicus in normal conditions. The rough outline of the stomach resonance may be defined after giving successively the two portions of a seidlitz powder dissolved separately. In this way dilatation (§ 295) may be distinguished from gastroptosis (§ 296).

¹ Some say it is better to have the legs extended loosely; general anæsthesia may be necessary in obscure cases.

§ 278. The **Motor Functions** of the Stomach and Intestinal Tract are most accurately investigated by X-ray examination after an opaque meal.

There is considerable individual variation. Delay in the alimentary canal may be tested by giving a teaspoonful of charcoal the night before a test breakfast. Charcoal so given should appear in the faeces in thirty-six to forty-eight hours. If it does not appear on the second morning, an enema should be given. The presence of charcoal in the returned enema shows delay in the lower colon; if it is not present, the delay is higher up. This test is not very accurate.

X-RAY EXAMINATION is carried out with the fluorescent screen after giving 3 ounces of barium sulphate suspended in a suitable sweetened medium. Radiograms taken can be studied afterwards. The *barium meal* is seen passing down the œsophagus and any obstruction or diverticulum is noted. The outline, position, tone and the rate and character of the peristaltic movements of the stomach are observed, the time at which it is empty, and the passage through the pylorus and duodenum. Irregularity of outline may be seen and local tenderness felt if there is a growth of the stomach, and if the barium lodges in the crater of an ulcer. During the filling or emptying of the stomach, the folds of mucous membrane are defined, and give valuable information. The normal shape of the duodenal cap is characteristic, and is altered by ulcer, adhesions or pressure from without, as by a distended gall-bladder. The position and mobility of the lower ileum and cæcum are observed, and the appendix may be seen filled. The passage of the barium through the colon is watched at intervals. Normally the stomach empties in three-and-a-half to five hours; the terminal ileum and cæcum begin to fill about the same time. The terminal ileum should be clear of material four hours after the stomach is empty, and the colon should be clear in seventy-two hours. Abnormal appearances of the stomach, duodenum and colon are seen in Figs. 68 to 73. With a *barium enema*, the colon is observed filled and after evacuation, and if necessary with air inflation.

§ 279. **Examination of Stomach Contents.**¹—First, as to the CHEMISTRY OF DIGESTION, and the practical information to be derived from clinical examination of the stomach contents. *Four processes* normally take place in the stomach: (1) The conversion of starch into sugar, begun in the mouth, is carried a stage further; (2) proteins are changed into peptones; (3) fat globules are set free from their envelopes; (4) milk is curdled. Delay in digestion may be caused by (1) deficient peristalsis of the stomach walls, (2) deficient quality or quantity of the gastric juice, (3) the consumption of indigestible articles, or (4) the dilution of the gastric juice by drinking too much fluid at meal-time.

The gastric juice contains HCl, water, pepsin, rennin, mineral salts, a *little* mucus, and Castle's intrinsic factor (§ 539). Pepsin and rennin exist in the secretory cells only as zymogens, which, on secretion into the stomach, become active ferments or enzymes. In the healthy state, as the result of digestion, about 30 c.c. of fluid should be obtained from the stomach one hour or so after a test-meal (*vide infra*), straw-coloured, without much odour, without organic acid, and with about 0.2 per cent. of free HCl.

As regards *hydrochloric acid*, much depends on the time of examination. *Hyperchlorhydria* has come to be somewhat loosely used for "excessive acidity," and thus to be confused with the acidity of fermentation (due to organic acids). On the other hand, after a meal, a negative result on testing for HCl would indicate the absence of peptic activity, as an acid is required for the normal digestive action of pepsin. Excess of HCl is distinctive of pyloric or duodenal ulcer. HCl is diminished in catarrhal conditions of the mucous membrane, in many anæmias, in the majority of cases of malignant disease, during pregnancy, and in states of nervous exhaustion.

Three organic acids are met in the presence of fermentation in the stomach, *lactic acid*, *butyric acid* and *acetic acid*. *Lactic acid* is most easily recognised on testing with Uffelmann's reagent, and is the only one of diagnostic importance. It is normally absent in the gastric juice after digestion has proceeded for one hour, but traces may

¹ It is not possible here to give more than a brief outline of this important subject.

be found, due to the ingestion of lactic acid in certain foods, or to fermentation in the mouth. Fermentation occurs when HCl is deficient or when there is delayed emptying of the stomach: lactic acid is most frequently found in cases of gastric cancer with achlorhydria.

The secretion of *pepsin* is not interfered with, unless there be destruction of the glands of the stomach. An acid secretion without peptic activity does not occur.

Renninogen and Rennin are diminished or absent in the later stages of gastritis and cancer. The amount of rennin is directly proportional to the quantity of pepsin.

Examination of Gastric Contents after a Test-meal is a useful method of investigating the secretion and emptying of the stomach. The gastric contents should be tested in all doubtful cases of digestive disturbance.

The **fractional test-meal** yields information as to the gastric secretion, the emptying of the stomach and the neutralisation of excessive acid by the reflux of alkaline duodenal contents. A soft rubber tube (Ryle), with an oval perforated bulb at the end, is swallowed, any resting contents are withdrawn with a small glass syringe, and then a pint of test gruel is drunk with the tube in position. (The gruel is made with two tablespoonfuls of breakfast oatmeal mixed with one quart of water, and boiled down to one pint and strained.) The tube is kept in position whilst the patient reads quietly. During the next two to three hours, at intervals of a quarter of an hour, about 10 c.c. are drawn up and placed in a numbered test tube. If three or four tubes have shown no acid with congo-red indicator, histamine may be injected subcutaneously (0.25 mg. histamine or 1 mg. histamine acid phosphate), in order to excite secretion. The contents of the test tubes are separately examined and a curve plotted. Record the appearance, smell, consistency, and presence of excess of mucus, bile, or blood in each specimen. **MICROSCOPICALLY**, we can detect fat globules, starch cells, vegetable and muscle fibres, residues of delayed emptying, cells of the mucous membrane, *torulæ cerevisiæ* or *sarcinæ*, and pus cells. Epithelial cells may be in excess in carcinoma. The Oppler-Boas bacillus may sometimes be seen on examination under the high-power lens. **CHEMICALLY**, the stomach contents are normally acid, although 4 per cent. of otherwise normal people have no acid in the gastric juice. The normal acidity is due to *free hydrochloric acid*, much of which is loosely combined with proteins. In the absence of free HCl, the acid present is due to organic acids, such as lactic and butyric acids produced by fermentation in the stomach (*e.g.*, in gastric carcinoma), and this is combined with protein. The sum of the free acid and the combined acid gives the *total acidity*.

To estimate the *free hydrochloric acid*, titrate 5 c.c. of the filtered gastric contents with N/10 solution of caustic soda, using a 1 per cent. solution of dimethylamido-azobenzol as the indicator, and add the alkali till the pink colour is discharged. Then add phenolphthalein as an indicator, and add more NaOH till the red colour of the phenolphthalein is developed. The amount of alkali added in the first instance is a measure of the amount of free HCl present, and the total amount of alkali added is a measure of the free + combined acid, *i.e.*, the total acidity. The results are usually expressed in terms of c.c. N/10 NaOH per 100 c.c. gastric juice, and in the fractional method of gastric analysis, may be plotted in the form of a graph.

Lactic acid may be detected by adding Uffelmann's reagent (made by mixing a little 5 per cent. solution of carbolic acid with a few drops of liquor ferri perchloridi). The blue colour is discharged by lactic acid and a yellow colour is produced.

PART C. DISEASES OF THE STOMACH, THEIR DIFFERENTIATION, PROGNOSIS AND TREATMENT

§ 280. **Routine Investigation.** **FIRST:** We must identify the patient's **LEADING SYMPTOMS** as being referable to gastric disorder (see Part A).

SECONDLY: Inquire as to the **HISTORY**, and especially whether the symptoms came on *acutely* and recently, or whether, as is more usual,

the illness came on insidiously, and has run a *chronic* course. Much depends on the skill and method with which the history is elicited. Inquire particularly as to pain or discomfort and its relation to meals, and as to the other symptoms mentioned in Part A.

THIRDLY: Proceed to the PHYSICAL EXAMINATION, and ascertain whether there be any localised tenderness and pain, and whether any tumour or other abnormality be present.

If the patient's symptoms have come on gradually, and lasted a considerable time, turn to **Chronic Disorders** of the Stomach (§ 283).

If, on the other hand, his symptoms have begun somewhat suddenly and recently, the case is probably one of the two **Acute Disorders** of the Stomach: I. ACUTE DYSPEPSIA; or, II. ACUTE GASTRITIS.

I. *The patient—whose temperature is normal—complains of NAUSEA, GASTRIC DISCOMFORT, headache, and depression, which have come on suddenly; there is a little epigastric tenderness.* The disease is probably ACUTE DYSPEPSIA.

§ 281. **Acute Dyspepsia** ("Bilious Attack," "Congestion of the Liver") consists of a sudden disturbance of the digestion in a previously healthy person, such as occurs in association with surfeit, high living or other errors in diet.

The *Symptoms*, which come on suddenly, are: (1) Pain, or a feeling of oppression or distension in the epigastrium, occasionally accompanied by slight tenderness on pressure. (2) Nausea and vomiting often follow. (3) Headache, depression, anorexia, coated tongue, constipation, scanty urine loaded with urates. (4) The illness is sometimes preceded and accompanied by drowsiness, and there is often a history of previous similar attacks.

The *Diagnosis* is easy, the only similar condition being acute gastritis, in which the constitutional symptoms are more apparent, the duration of the illness considerably longer, and the *tenderness much more marked*. Irritant poisoning comes on more suddenly with urgent vomiting (§ 271). Similar symptoms may usher in certain infectious diseases.

Etiology.—(1) Too large a meal, especially after previous fatigue. (2) Errors in diet, such as excess of alcohol (which retards digestion), fats, ice, and many other articles which vary with the idiosyncrasy of the individual.

Prognosis and Treatment.—Acute dyspepsia usually passes off in two or three days. (1) If pain be present, assist vomiting by mild emetics, such as copious draughts of salt and water, tickling the fauces, etc. Violent emetics aggravate the condition. (2) Three grains of calomel or blue pill, and milk diet for a day or two, generally relieve. (3) Bismuth and tonics may be given during convalescence.

II. *The patient complains of considerable PAIN or discomfort, and TENDERNESS IN THE EPIGASTRIUM, with nausea or vomiting, all of which have come on somewhat suddenly.* The disease is probably ACUTE GASTRITIS.

§ 282. **Acute or Sub-acute Gastritis** is relatively a much more serious disorder than the foregoing. It consists of a sudden derangement of digestion due to inflammation of the mucosa of the stomach.—

✓ *Symptoms.*—(1) Pain, intense and burning, or a feeling of distension in the epigastrium, coming on directly after food, and accompanied by tenderness on pressure. (2) Vomiting, not always immediately after a meal, of undigested food, sometimes with streaks of blood. (3) Malaise, anorexia, slight pyrexia, headache, depression, and other constitutional symptoms may be present, attended sometimes by great prostration, thirst, furred or coated tongue. (4) Diarrhoea may ensue after a day or two.

The *Diagnosis* may have to be made from acute dyspepsia (§ 281), and from other causes of vomiting (§ 271).

Etiology.—(1) In the majority of cases simple acute gastritis is caused by errors in diet, or by decomposing (or infected) meat; alcohol or an excessive quantity of normal food also causes it. (2) Irritant poisons (*e.g.*, arsenic, antimony, phosphorus, etc.). In long-continued vomiting, without apparent cause, poisoning should be suspected, and the vomited matters examined. (3) In some cases, gout and other constitutional conditions predispose to or determine an attack. Heart, lung, and liver diseases are predisposing causes.

Prognosis.—Recovery generally takes place in about three to six days, the affection rarely lasting longer than eight or ten days. It may go on to chronic gastritis. Death rarely takes place, excepting from irritant poisoning or in cases of membranous gastritis.

Treatment.—The indications are: (1) To remove any irritant that may be present in the stomach. This can be done by promoting vomiting, especially if the epigastric pain continues. The stomach may be washed out with saline or a weak solution of bicarbonate of soda. It may be desirable to give a purgative, such as 3 grains of calomel (if there is vomiting, $\frac{1}{2}$ grain doses hourly), followed by a seidlitz powder next morning. Hot fomentations or a mustard leaf to the epigastrium may relieve the pain. (2) The second indication is rest to the stomach, which is gained by twelve or twenty-four hours' abstinence from food, followed by fruit juice and glucose, and then milk in small quantities. Later on, bismuth combined with opium is the best treatment. The milk diet should be supplemented only very gradually.

CHRONIC DISORDERS OF THE STOMACH

§ 283. *The patient, whose temperature is normal, complains of "Chronic Indigestion,"—i.e., pain or discomfort in some way connected with his food, which has probably come on gradually, and may have lasted a long time.*

Note the relationship of the discomfort or pain to food and examine for tenderness. Guidance may be obtained from the following summary.

TABLE XVI.

The patient complains of SUBSTERNAL PAIN ON SWALLOWING FOOD	Dysphagia	§ 219
The discomfort FOLLOWS MEALS, and is RELIEVED by vomiting and belching	Chronic gastritis	§ 284
There is DISCOMFORT and PAIN, RELIEVED by alkalies and by food	Acid gastritis	§ 285
There is PAIN, AGGRAVATED BY FOOD and there is TENDERNESS on the left	Gastric ulcer	§ 289
The pain is RELIEVED BY FOOD and there is TENDERNESS on the right	or gastro-jejunal ulcer	§ 291
The pain, 3-4 hours after food, is associated with NAUSEA, VOMITING, and distension on the right side	Duodenal ulcer	§ 290
There is CONSTANT DISTENSION in the epigastrium and attacks of pain on the right side	Duodenal ileus	§ 292
There is pain, which is constant and AGGRAVATED BY FOOD; there is FLATULENCE and NAUSEA, UNRELIEVED by BELCHING	Duodenal diverticulum	§ 293
There is DISCOMFORT following meals, variable in position, with FLATUS which passes downwards	Cholecystitis	§ 354
There is PAIN which FOLLOWS EFFORT	Colitis	§ 310
There is severe and INTERMITTENT PAIN, not connected with FOOD or EFFORT	Angina pectoris	§ 51
Pain is more or less CONSTANT, with DISTENSION and FLATULENCE:	Gallstones and tabetic crises	§§ 353, 817
Cancer of the stomach		§ 294
Chronic dilatation of the stomach		§ 295

Many disorders unconnected with the stomach may give rise to symptoms of chronic indigestion; among these the following may be mentioned: Pulmonary tuberculosis (of which dyspepsia is often the earliest symptom), Appendicitis, Colitis, Anæmia, Abdominal Tumour, Cardiac, Hepatic, Renal or Uterine Disease, various Nervous Disorders, and Pancreatic Disease (rare).

I. *The patient complains of CHRONIC INDIGESTION, and the epigastric pain or discomfort comes on SOON AFTER A MEAL.* The disease is probably CHRONIC GASTRITIS.

§ 284. **Chronic Gastritis** is the commonest form of chronic dyspepsia. It was formerly called atonic or nervous dyspepsia. The *symptoms* are: (1) Pain or distress, usually in the epigastrium, coming on immediately or very shortly after food—especially fried and greasy food. The pain may be in the back or shoot up to the shoulders; or there may be no definite pain, only a feeling of weight or distension. It may be accompanied by tenderness and is often relieved by eructations of wind. (2) The appetite is usually diminished; it may be good, but ceases quickly after beginning the meal. Often breakfast is well taken, lunch not so well, and later meals worse. (3) There is a bad taste in the mouth. The tongue is flabby, dry and indented by the teeth. (4) There is a tendency to eructation and heartburn; nausea, even vomiting may occur, but not frequently. (5) There are languor, headache, depression, disturbed sleep, ready fatigue, and general discomfort and drowsiness after meals. There may be palpita-

tion, dyspnœa and other cardiac symptoms : sometimes acne rosacea and urticaria.

There are three stages : First, a simple *congestion*, in which the hydrochloric acid is diminished. The second stage is one of *mucous catarrh*, in which there is a large secretion of mucus, and hydrochloric acid is almost completely absent. In the third stage there is *atrophy* of the



FIG. 68. *Right.*—Hypertrophic gastritis of greater curvature, showing the feathered appearance indicated by arrows. *Left.*—The same with the stomach filled.

mucous membrane ; both hydrochloric acid and pepsin are now absent. Pernicious anæmia may be associated with this stage ; some believe malignant disease may follow in after years.

Etiology. (1) Errors of diet, including deficiency of vitamin B ; (2) defective teeth and inadequate mastication ; (3) acute and chronic febrile diseases, sepsis, anæmia, infected teeth or tonsils. Dyspepsia is often the earliest symptom met with in pulmonary tuberculosis. (4) Abuse of tobacco and alcohol. (5) Circulatory diseases, early hypertension, nephritis, and various abdominal disorders—*e.g.*, appendicitis,

chronic colitis, gall-bladder disease, abdominal or pelvic tumour. (6) It may be part of organic disease of the stomach, such as ulcer, syphilis or early pyloric cancer.

Diagnosis. The subjective symptoms are not characteristic, and chronic gastritis is usually secondary to disease elsewhere in the body. Some forms of chronic gastritis do not give rise to digestive symptoms, the patient complaining only of weakness and exhaustion. Test meal, gastroscopic and X-ray examinations are necessary for the diagnosis of the state of the stomach. There is excess of mucus and usually diminution of hydrochloric acid, while the stria picture of the stomach shows thickening or thinning of the mucosal folds. Alcoholic and acid gastritis are special varieties (see II and III below). The important stomach conditions to be differentiated are *gastric ulcer* in the young, and *cancer of the stomach* in the middle-aged and old (see Table XVII, p. 345). *Achylia gastrica* is the late stage of chronic gastritis and may be accompanied by acne rosacea, visceroptosis and ileal stasis: it also occurs in Addisonian anæmia.

II. *In addition to other symptoms of CHRONIC INDIGESTION, the patient has much nausea, and VOMITS MUCUS IN THE MORNING, occasionally streaked with blood. The disease is probably ALCOHOLIC GASTRITIS.*

Alcoholic gastritis is produced by persistent dietetic errors, especially alcoholic excesses, and is aggravated by the venous congestion arising from cirrhosis of the liver.

III. *The patient complains of BOUTS OF INDIGESTION, in which the discomfort does NOT come on SOON AFTER A MEAL, is followed by VOMITING OF ACID FLUID, and is RELIEVED BY FOOD and by alkalies. The discomfort consists of SINKING FEELINGS in the epigastrium, or HUNGER PAINS. The disease is probably ACID GASTRITIS.*

§ 285. **Acid Gastritis** (Acid Dyspepsia, Hyperchlorhydria) is due to causes which bring about directly or reflexly excessive secretion of gastric juice, or retention with pyloric spasm. Among these are nervous strain and worry; alcohol, tobacco and condiments; colitis, appendicitis, cholelithiasis, gastric or duodenal ulcer, and duodenal diverticulum. In *achylia gastrica* there may be acid eructations, but these are due to organic acids formed by fermentation.

The *Prognosis of Gastritis* depends on the cause and the duration of the symptoms. It is never fatal, but often renders life wretched for the sufferer. If met early, treatment should be thorough; if untreated, dilatation of the stomach, general malnutrition and neurasthenia may develop. Simple alcoholic gastritis soon recovers. The outlook is more grave when due to general toxic states or when there is irremovable venous obstruction.

Treatment of Gastritis.—(1) Remove the cause. Correct faulty habits of chewing and bolting the food, remove infected teeth and provide efficient dentures, treat any catarrh of the nose or infection of the tonsils. Reduce or prohibit alcohol and tobacco. (2) Local treatment: Gastric lavage with water or sod. bicarb. (gr. 60 to $\bar{O}i$); hydrogen peroxide (\mathcal{M} 30 to $\bar{O}i$) may be used. (3) Substitution therapy with hydrochloric

acid, ℞ xv with bitters before meals in suitable cases; in achylia give ℞ 60 of dilute hydrochloric acid in a tumbler of diluted orange juice to be sipped with meals. (4) Diet does not depend on the character of the gastric secretion (§ 297. I and II). Small dry meals of simple but varied foods, avoiding condiments as a rule, are best. Give vitamin B as wheat germ or marmite. (5) Symptomatic treatment: For the pain, bismuth or magnesium carbonate, dilute hydrocyanic acid; for fermentation and acidity, sulphocarbonate of soda, kerol and alkalies two or three hours after a meal. Mucous vomiting is relieved by draughts of hot water, with alkalies, before breakfast. For flatulence, 20 grains of sodium bicarbonate in a cupful of hot water, with 20 drops of tincture of ginger, give great relief. Some find helpful pepsin, lactopeptine, takadiastase, or other artificial digestives. (6) General measures. Attention to the general health is necessary. A holiday from work, with regulated exercise and diet, and the treatment of sleeplessness, may be required at the beginning. Abdominal massage, electricity and exercises to improve muscle tone are important curative measures. Rest before and after meals is excellent in nervous cases. In acid gastritis, olive oil ℞ 60 before meals or atropine gr. 1/150 inhibits secretion.

IV. *The patient complains of NAUSEA and ERUCTATIONS, having no definite relation to the taking of food, and careful investigation reveals NO STRUCTURAL DISORDER OF THE STOMACH. The case is probably one of NERVOUS DYSPEPSIA.*

§ 286. **Nervous Dyspepsia** was formerly a frequent diagnosis, but modern investigations have shown that these symptoms are usually due to gastritis or to disease elsewhere in the abdomen. The constant discomfort and distress of gastric disorders bring about a neurasthenic and depressed state. On the other hand, flatulence is common in anxiety neurosis. Anxiety and worry cause spasm, and therefore delay. By means of the fractional test meal and X-ray examination it has been discovered that with strong emotional states digestion may stand still for the first hour or more; then if the cause be suddenly removed, digestion proceeds rapidly from that moment. But it is not wise to diagnose gastric neurosis until all clinical and special investigations have been carried out to exclude organic disease. Air swallowing and rumination are not gastric diseases, but bad habits, and are to be treated by explanation and psychotherapy.

V. *The patient complains of INDIGESTION. The PAIN COMES ON DAILY, WITH CONSTANT RELATION TO FOOD. It is RELIEVED by LIQUID FOOD and by ALKALIES. There is TENDERNESS ON PRESSURE. The disease is probably an ULCER.*

§ 287. **Simple or Peptic Ulcer** may be acute or chronic, and may be situated in the stomach, or the duodenum as far as the ampulla of Vater. The ulcers probably arise by peptic digestion of areas of mucous membrane which have been injured by toxins swallowed from the mouth or pharynx, or absorbed from septic foci elsewhere in the body. They tend

to heal readily unless there is gastric stasis and superacidity, when they become chronic, erode the wall of the viscus and may invade adjacent organs.

Va. The patient complains of severe PAIN, PRODUCED BY FOOD and RELIEVED BY VOMITING, the vomit sometimes containing a quantity of blood. The disease is ACUTE ULCER OF THE STOMACH.

§ 288. **Acute Peptic Ulcer** is less common than formerly. It occurs in the second and third decades of life. The ulcers are usually small and multiple. There are three very characteristic features, to which the symptoms of chronic dyspepsia may be added:

(1) *Pain* of an intense boring character usually limited to one spot, (2) *aggravated by food*, and accompanied by tenderness. A small, very tender area is sometimes present, and is characteristic. It is usually situated in the epigastrium. (3) The pain is *relieved by vomiting*, which comes on soon after food. The vomited matter contains an excess of hydrochloric acid. (4) *Hæmatemesis*, which may be profuse, may come on suddenly from time to time. (5) The appetite is usually normal or increased, but the patient avoids food because of the pain it produces. There is generally constipation and anæmia, and often a history of inadequate food and lack of fresh air. In some cases there may be no symptoms until profuse hæmorrhage or perforation suddenly occurs.

The *Diagnosis* is not difficult if pain, an area of tenderness, and hæmatemesis be present. The last, which was thought to be the most characteristic symptom, is now known to be very profuse in gastrostaxis (§ 272). Chronic appendicitis may simulate the disease. See Table XVII.

Treatment of Acute Ulcer.—In all but the mildest cases the patient must rest in bed. Treatment of hæmorrhage is given in hæmatemesis (§ 272). In cases of perforation immediate laparotomy is the best treatment. Where there is recent hæmorrhage or intractable vomiting, no food is allowed by the mouth; but ice may be sucked, and feeding is solely per rectum. Suitable diets are given in § 297. III. All foci of infection—teeth, tonsils, appendix, gall-bladder—must be removed later. Chronic inflammation of the appendix must be remembered.

Vb. The patient who is MIDDLE-AGED and is enfeebled by illness or anxiety, complains of INDIGESTION at REGULAR INTERVALS AFTER FOOD, which is RELIEVED BY taking LIGHT FOOD AND BY VOMITING. The disease is probably CHRONIC GASTRIC ULCER.

§ 289. **Chronic Ulcer of the Stomach** is usually single. It occurs more frequently in men than in women. The patient is often thin and miserable and may complain of (1) “chronic dyspepsia.” (2) Attacks of pain in the epigastrium, left upper abdomen or back, come on half an hour to two hours after a meal and pass off before the next meal. (3) The pain is often described as an aching or gnawing pain, and is located to a definite area of the upper abdomen. (4) The appetite is poor or may be restrained, the patient being afraid to take solid food and feeling better when resting and on light food. (5) Nausea and vomiting may occur, and the latter is

sometimes induced by the patient to obtain relief. (6) Antacid mixtures and powders, almost invariably relieve the pain. (7) Hæmatemesis is not common. Constipation is usual.

Physical signs.—Particularly during a bout of pain, deep pressure in the mid-line of the epigastrium usually indicates a definite local area of

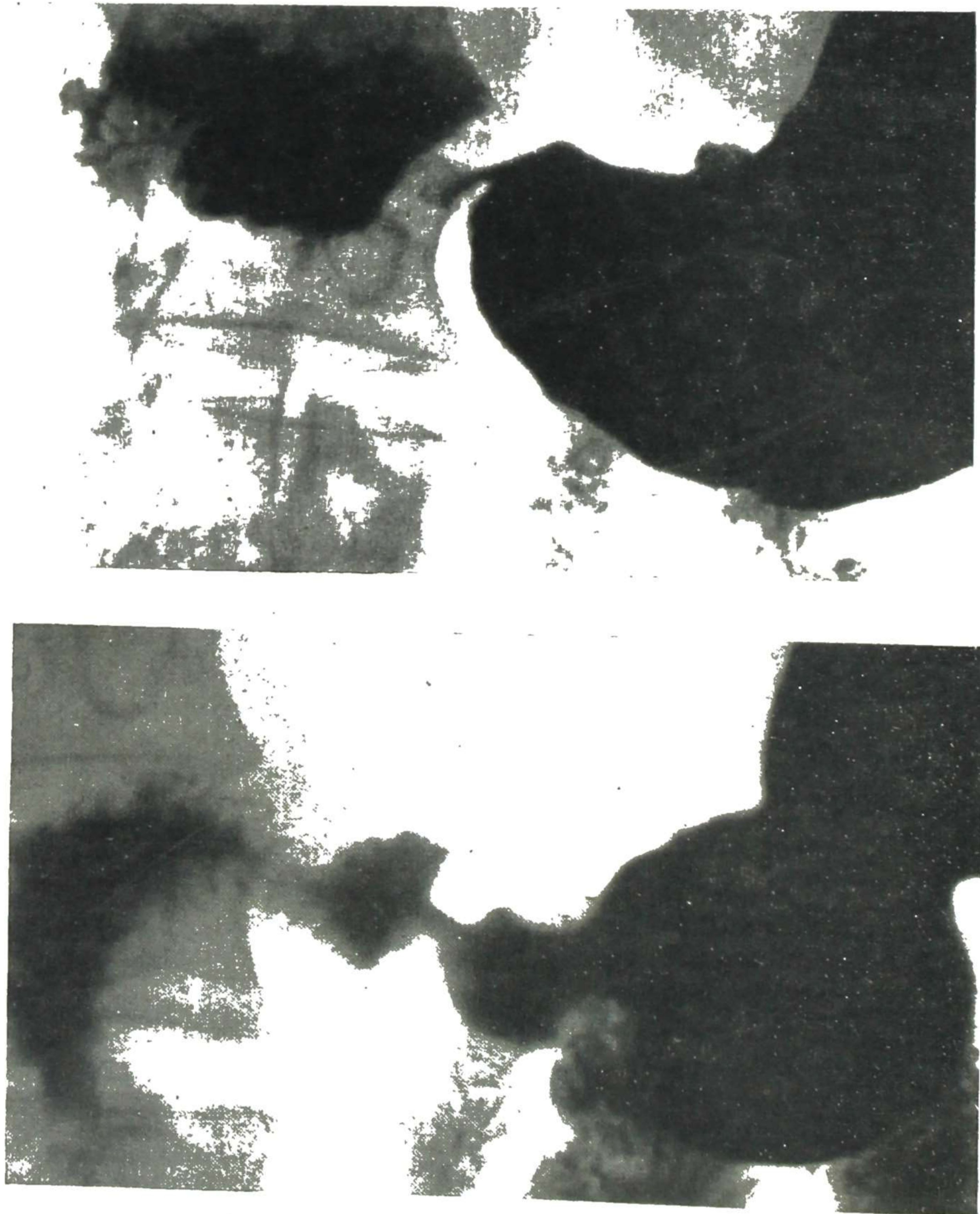


FIG. 69.—GASTRIC ULCER ON LESSER CURVATURE.
Lower figure shows ulcer nearly healed after three weeks' treatment.

tenderness. In some cases, there is guarding of the left upper rectus abdominis, and deep tenderness may be elicited over the actual site of the ulcer.

Etiology.—The primary condition is probably one of gastritis; superimposed on this are other factors such as fatigue, overwork, worry, oral

sepsis, or irregular meals, which cause the inflamed gastric mucosa to ulcerate. Two groups of patients may be found: (1) Young or middle-aged women debilitated by overwork in poor surroundings, poor food or after infectious diseases. They are usually anæmic, thin and easily tired. The ulcer may be part of a general gastritis. (2) Elderly men who have pyorrhœa or have lost their teeth. In these cases, also, overwork or excess of tobacco smoking may contribute. In some instances the ulcer symptoms may be masked by tiredness and a sense of exhaustion.

The *diagnosis* is not difficult when the characteristic pain with epigastric tenderness is present, but pain after food, relieved by emptying the stomach, with occasional vomiting of blood, may occur in other diseases. The pain may be continuous if there are local complications such as adhesions to surrounding organs or chronic perforation. Every case of "chronic dyspepsia" should be investigated. The test-meal and efficient

TABLE XVII.

	CHRONIC GASTRIC ULCER.	MALIGNANT DISEASE.	CHRONIC GASTRITIS.
<i>Pain</i> . . .	1½-2 hours after food.	Constant discomfort.	Immediately after food.
<i>Aggravated by</i>	Large meals and condiments.	Meat.	Fried foods.
<i>Appetite</i> . .	Usually good.	Anorexia often marked.	Poor.
<i>Duration of symptoms</i> .	For months or years.	Recent, and not responding to treatment.	Often long-standing.
<i>Vomiting</i> .	Not frequent; relieves pain.	Often large quantity every few days.	Morning vomiting of mucus, especially with alcohol.
<i>Hæmatemesis</i>	Occasional but profuse; therefore bright red.	A continuous oozing; therefore "coffee-ground" in character.	Rare; and only streaks, unless in the venous congestion due to heart disease.
<i>Tumour</i> . .	None.	Present, though may not be palpable; secondary deposits may be recognisable in liver, peritoneum, glands, etc., later.	None.
<i>Age</i> . . .	Thirty to fifty.	Usually men over forty.	Any age.
<i>Course</i> . .	Recovery if well treated; with relaxation of régime, relapses occur.	Fatal in one or two years if not removed.	Liable to pass on to a chronic dyspepsia.

X-ray examination are the chief means of coming to a diagnosis. The stomach contents usually show increased free hydrochloric acid and total acidity, except where an atrophic gastritis is present. In the X-ray examination the crater of the ulcer projecting into the wall of the stomach may be filled by the barium emulsion and there is often spasm of the circular muscle which produces an incisura opposite the ulcer; at the filling and emptying stages of the meal there is a characteristic spider-form of the striæ of mucous membrane converging towards the ulcer. In the hands of experts the ulcer may be shown with the gastroscope (Table XVII, p. 345).

The *prognosis* is usually favourable if treatment is carried out early, and the general condition of the patient medically and socially attended to. If untreated, perforation into the peritoneal cavity or hæmorrhage may occur; in healing cicatrization may lead to distortion or stricture of the stomach (hour-glass) or of the pylorus (stenosis). Death occasionally results from hæmorrhage and in a small proportion of cases of chronic ulcer of the stomach cancer may develop in the site of the ulcer.

Treatment is described in § 290.

Vc. *The patient is a healthy-looking ACTIVE MAN, who FOR YEARS HAS HAD ATTACKS OF ACIDITY after overwork, worry or indigestible food: he DEVELOPS PAIN 3-4 HOURS AFTER FOOD or in the night: RELIEVED by TAKING FOOD OR ANTACIDS. The disease is CHRONIC DUODENAL ULCER.*

§ 290. **Chronic Duodenal Ulcer** is eight times as frequent in males as in females. The *symptoms* often begin at the age of 20-35, and tend to come in attacks after dietetic errors, overwork, worry or exposure. (1) Epigastric pain, sometimes intense, and usually of nagging or gnawing type, comes on when the stomach is empty 3-4 hours after food—the so-called “hunger-pain,” which frequently wakes the patient at about 2 a.m. and is almost immediately relieved by food. The pain tends to come at a regular time each day or during the night. (2) Vomiting is sometimes complained of, especially in a particularly severe bout of pain: it is due to pylorospasm, and after the stomach is emptied, relief is immediately obtained. (3) The pain may radiate to the back, and become more constant when the ulcer burrows into the head of the pancreas. (4) Sudden intestinal hæmorrhage may occur, evidenced by melæna, and sometimes preceded or accompanied by hæmatemesis.

Physical signs are always more marked during one of the recurrences of symptoms. There is often rigidity, or resistance to palpation, in the right upper quadrant of the abdomen. Deep tenderness is usually present in the mid-line just above the umbilicus, and/or locally over the site of the ulcer in the first part of the duodenum. *X-ray examination* reveals either pyloric spasm and delay, or the stomach contents rush through with rapid emptying of the stomach; a series of radiograms, rapidly taken, may reveal characteristic irregularity of the duodenal cap (Fig. 70). Hyperchlorhydria is usual.

Diagnosis.—In typical cases, the characteristic pain makes the

diagnosis easy. Chronic gastric ulcer, stone in the gall-bladder or kidney, and chronic appendicitis are to be differentiated. The diagnosis is confirmed best with the X-rays. A fractional test-meal and the discovery of occult blood in the fæces may help in obscure cases. Similar symptoms, but with left-sided pain, may accompany ulceration occurring after gastro-enterostomy (see *Vd*).

Prognosis.—Medical treatment is usually successful, but it must be adequate. Insufficient treatment is the cause of non-success, as the ulcer readily heals superficially, but tends to relapse easily unless time is

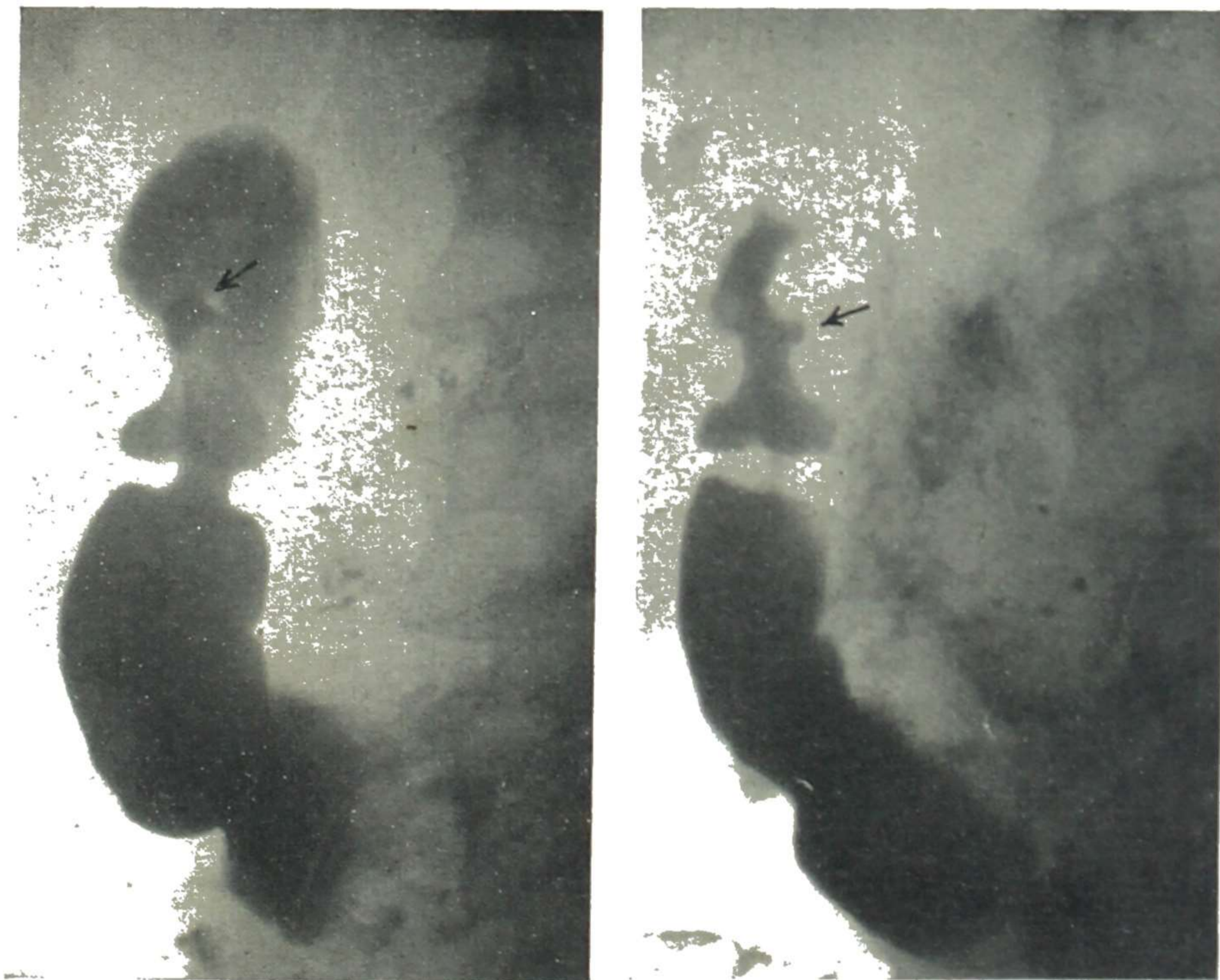


FIG. 70.—A DEFORMED DUODENAL CAP WITH AN OPAQUE SPOT IN THE CENTRE.

The right-hand illustration shows the same duodenal cap (in the second left oblique view). The ulcer (see arrow) can be seen as a spur on the posterior surface, with opposing spasm.

given to allow healing to take place throughout. Perforation, hæmorrhage or recurrence after thorough medical treatment are indications for surgical interference. Operation should always be followed by careful medical treatment.

Treatment of Chronic Gastric and Duodenal Ulcers. The indications are to (1) rest the patient, (2) give a sufficiency of nourishing food which will call for little digestive effort, (3) reduce the superacidity of the gastric juice and (4) eliminate all sources of sepsis. (1) It should be stipulated that the patient be in bed 4–6 weeks, followed by slowly getting up and not returning to work for at least 3 months. (2) The food given will be

such as will neutralise the stomach acid, will excite little secretion and of a bulk which will not distend the organ. Diet in the initial stages consists chiefly of milk of which 3-4 pints are consumed in the 24 hours: it may be diluted, citrated or mixed with egg as unboiled custard: feeds should be given at least every 2 hours during the day, with 1-2 feeds during the night, and many prefer that the milk be sipped continuously all the waking hours, or be administered by a continuous nasal drip directly into the stomach (§ 231). In 1-2 weeks, depending on the cessation of symptoms, cereals, bread and butter, biscuits, rusks and butter, steamed white fish, tender or minced meat or chicken, well-boiled rice and milk puddings are gradually added; and at the end of 3-4 weeks a light invalid diet is reached (and see § 297. III). All mechanical and chemical irritants in the diet should be avoided: to prevent deficiency of vitamin C, small amounts of orange juice or grape-juice are necessary. From the first, olive or arachis oil 1-2 teaspoonsful are given several times a day: this may be flavoured with peppermint water. (3) The superacidity of the gastric juices and thirst are remedied by sips of alkaline water ($\frac{1}{2}$ teaspoonful of bicarbonate of soda to 1 pint of water). Antacids neutralise the gastric secretion: teaspoonful doses of a powder containing bismuth carbonate 1 part, sodium bicarbonate 2 parts, magnesium carbonate 1 part, calcium carbonate 1 part, can be given half an hour after a meal: the proportions of bismuth carbonate and magnesium carbonate are varied so that constipation is avoided. It must be remembered that if too much sod. bicarb. is used for too long a period, alkalæmia and even uræmia may occur. The triple phosphates of magnesium and of calcium, magnesium trisilicate and colloidal aluminium hydroxide are also powerful antacids. Olive oil, cream and tincture of belladonna ℞ 3-5 twice or thrice daily restrict the acid secretion. Alcohol and smoking are forbidden until the ulcer has healed, and even then only allowed in moderation. (4) All foci of infection, e.g., septic teeth, infected tonsils, or chronic appendicitis, must be treated. Adequate mastication must be insisted on and artificial teeth fitted where necessary. The progress of healing may be determined by repeating the barium meal each 4-5 weeks, or by observation with the gastroscope.

Certain complications are liable to occur: any return of symptoms is an indication to resume a fluid diet. For pain or vomiting due to pylorospasm inj. atropine gr. $\frac{1}{150}$ and tinct. belladonnæ should be given: opiates are not advisable. Constipation is avoided by varying the composition of the antacid powder, by mist. magnes. hydrox., or by liquid paraffin or a plain paraffin emulsion. Anxiety and restlessness are treated by small doses of phenobarbitone, and sleeplessness by a moderately quick-acting barbiturate. Hæmorrhage requires opiates and complete rest; it is best to omit food by mouth for twenty-four hours, thirst being relieved by rectal fluids—water or hypotonic saline. After vomiting ceases diluted milk is given and the diet described above gradually adopted (§ 297 III). Perforation should be treated by omitting all food and medicine by

mouth, and usually by operation (§ 243), though occasionally perforation with adhesion to the posterior abdominal wall subsides without operation. Anæmia may require transfusion at the outset, followed by iron therapy.

Treatment should continue for 3 months on the strict lines laid down above, followed by a careful diet with regular 2-hourly, small, easily digested meals for 6 months or more (see post-ulcer diet, § 297. III). Part of this time should be spent on holiday before returning to work.

The indications for operation in peptic ulcer are (i.) perforation; (ii.) obstinate cases recurring after full medical treatment; (iii.) repeated hæmatemesis; and (iv.) pyloric obstruction and hour-glass stomach. Operation should always be followed by careful medical treatment and dieting for at least two years. Recurrence is by no means uncommon, even after excision of the ulcer or gastro-enterostomy has been performed: for this reason partial gastrectomy is often preferred.

§ 291. *Vd. Gastro-jejunal ulcer* may occur at the site of gastro-enterostomy. The ulcer is situated adjacent to the anastomosis. The *symptoms* resemble those of duodenal ulcer, but the pain is on the left side and may be referred to the left flank. X-ray or gastroscopy confirms the presence of an ulcer. Perforation may occur into the peritoneal cavity, but more usually the ulcer spreads into the gastro-colic omentum and if neglected a gastro-colic fistula may result. Hæmorrhage may give rise to hæmatemesis and melæna. Rest and diet as for peptic ulcer will usually relieve, but surgery may be required in complicated cases, when the gastro-enterostomy may be undone and after resection the stomach and duodenum restored to continuity.

§ 292. *Ve. Chronic Duodenal Ileus* occurs especially in viscerotonic patients who have lost weight or who lack abdominal muscle tone; it may follow a wasting illness, or a complicated child birth. *Symptoms* are in many ways similar to those of a duodenal ulcer (which may co-exist). Pain 3 to 4 hours after food, distension, nausea, and repeated vomiting occur. Anorexia, malaise, depression, migrainous headaches and other nervous symptoms may be present. *Diagnosis* is usually only possible by a barium meal, when the duodenum, lying to the right of the mid-line, is seen to be distended, to show to and fro peristalsis, and much delay in emptying. *Treatment*. A period of rest in bed (with the foot of the bed raised, or lying on the face) is necessary. Abdominal exercises, massage, and faradism to the abdominal muscles; small, frequent, nourishing meals, a supporting abdominal belt, and later, a change of environment help (and see § 251).

§ 293. VI. **Duodenal Diverticulum**.—Duodenal diverticula occur either as dilations of the terminations of the pancreatic ducts in the wall of the duodenum, or pouches formed by the contractions of adhesions resulting from previous inflammation. (i.) The patient is usually past middle age; (ii.) he complains of symptoms resembling those of chronic duodenal ulcer, but without periods of well-being; (iii.) attacks of severe bursting pain in the right hypochondrium may occur as the result of inflammation of the pouch; (iv.) hæmorrhage with sometimes severe melæna may occur. The *diagnosis* is made by X-ray examination. *Treatment* consists in giving a bland diet containing no hard or indigestible pieces; liquid paraffin (℥ 60) two or three times a day, preferably before meals, to which bismuth oxychloride (gr. 15) may be added if there is pain. In severe cases surgery may be indicated. Good results have followed, but the operation is serious because the pouches are usually embedded in the head of the pancreas.

PAIN is more or less CONSTANT with DISTENSION and FLATULENCE; the disease is probably CANCER or DILATATION of the STOMACH.

VII. The patient, who is in middle or advanced life, presents more

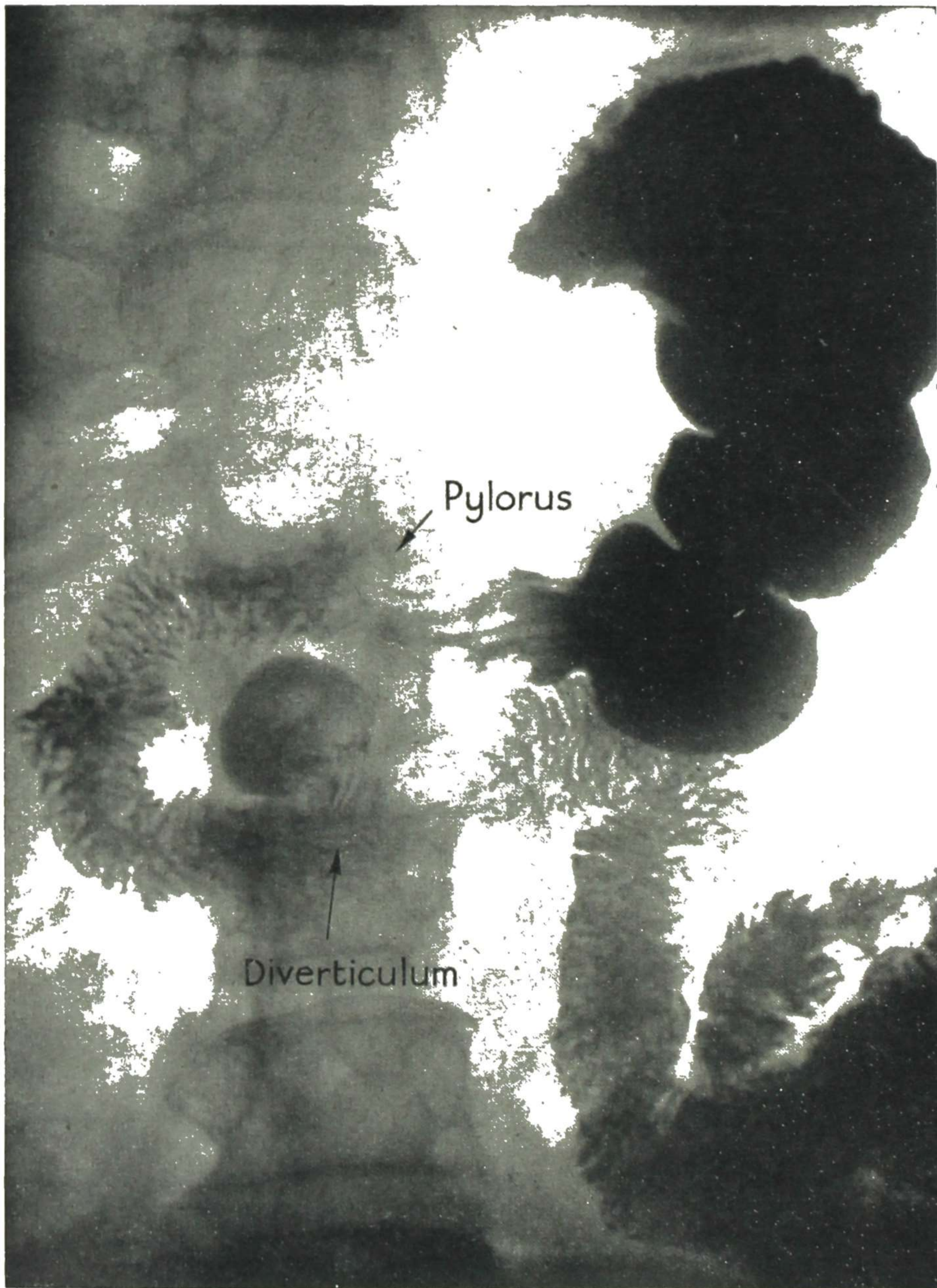


FIG. 71.—DUODENAL DIVERTICULUM; large mushroom-shaped diverticulum in the third part of duodenum.

CACHEXIA than could be accounted for by dyspepsia, and vomits from time to time "COFFEE-GROUND" MATERIAL. There is probable MALIGNANT DISEASE OF THE STOMACH. Gastric symptoms beginning in a patient of middle age or over should always be regarded as suspicious of cancer.

§ 294. **Cancer of the Stomach** (Synonym: Carcinoma ventriculi).—The clinical history rarely extends beyond one or two years. The *Early*

Symptoms depend largely on the situation of the disease. (i.) Loss of appetite, especially for meat and bulky foods, is usual. (ii.) A sense of epigastric discomfort, flatulence and fullness occur during the meal, or immediately afterwards, and may be associated with belching foul-smelling gas. (iii.) The pain is situated in the epigastrium or back, radiates in different directions, and is usually accompanied by tenderness but no rigidity. It is increased rather than diminished by taking food, and is sometimes continuous and independent of meals. (iv.) Vomiting may occur early or late, and usually indicates obstruction in some part of the stomach. Generally it takes place some time after the ingestion of food, the interval depending on the position of the lesion: thus, if at the cardiac end, the interval is short: if at the pylorus it may be hours after taking food. Sometimes the vomiting occurs every two or three days. An examination of the vomited matter often shows diminution or absence of hydrochloric acid and the presence of lactic acid. (v.) Some degree of anæmia is present in practically all cases by the time advice is sought. Sometimes this may be marked, and occasionally of megalocytic type as in pernicious anæmia. (vi.) Loss of general strength and energy, and an insidious loss of weight, are present at an early stage in most cases. Less frequent early symptoms include: (vii.) Brisk hæmatemesis or melana occurs in less than 5 per cent. of cases. (viii.) Sudden perforation is unusual. (ix.) Persistent diarrhœa associated with "a leather-bottle stomach" is sometimes met. (x.) Acanthosis nigricans, unexplained phlebitis, poly-

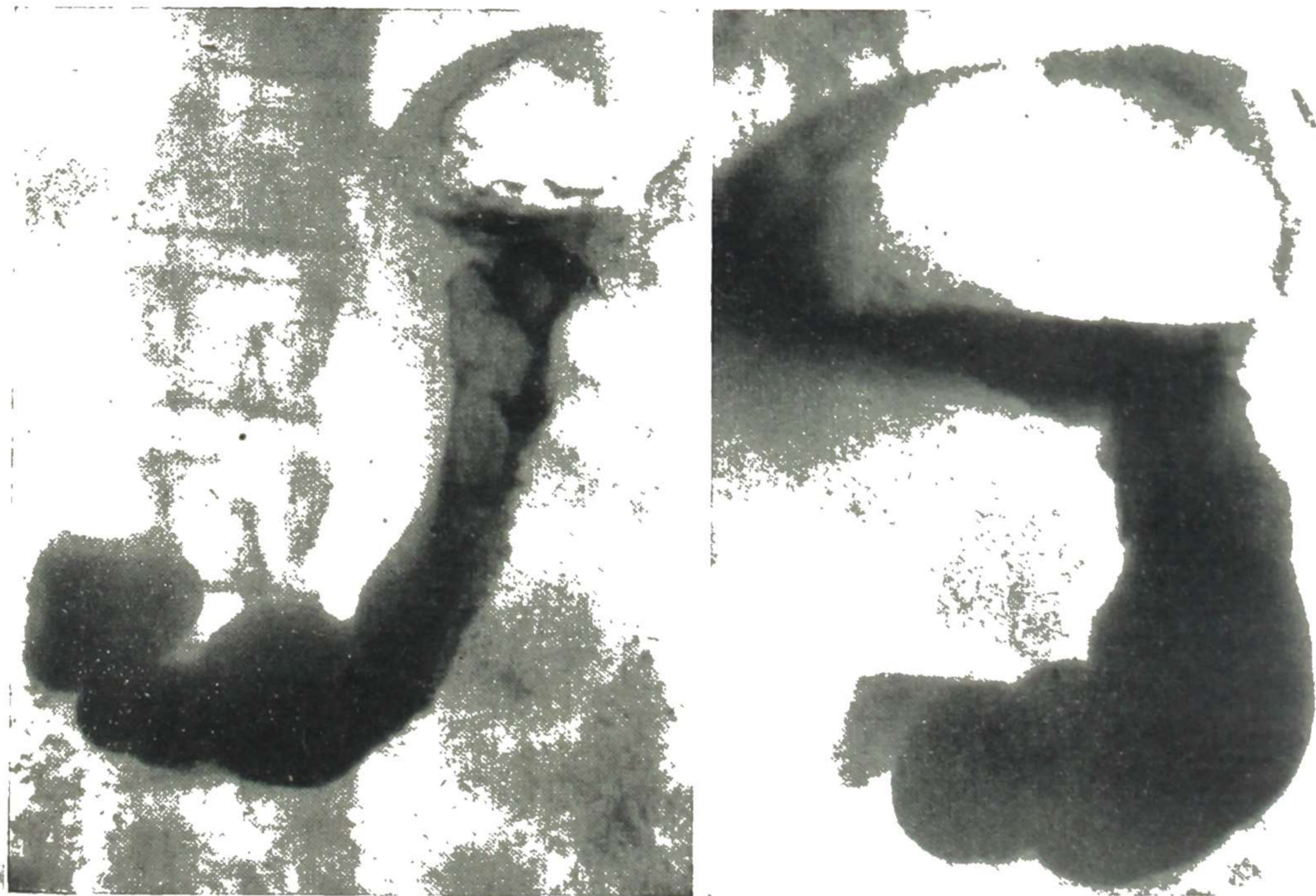


FIG. 72.—CANCER OF STOMACH, CARDIAC END; note, filled stomach does not expand.

neuritis and even Korsakoff's syndrome may be the first expression of the disease. *Late Symptoms*: (xi.) Cachexia becomes marked, anæmia prominent, and the sallowness of the skin may suggest pernicious anæmia or even jaundice. (xii.) The appetite becomes non-existent, and the profound anorexia and wasting seriously disturbing. (xiii.) Vomiting occurs as a fairly constant sign: even the body of the stomach may be sufficiently obstructed to make the reception and passage of food difficult. (xiv.) A tumour is present sooner or later in two-thirds of the cases.

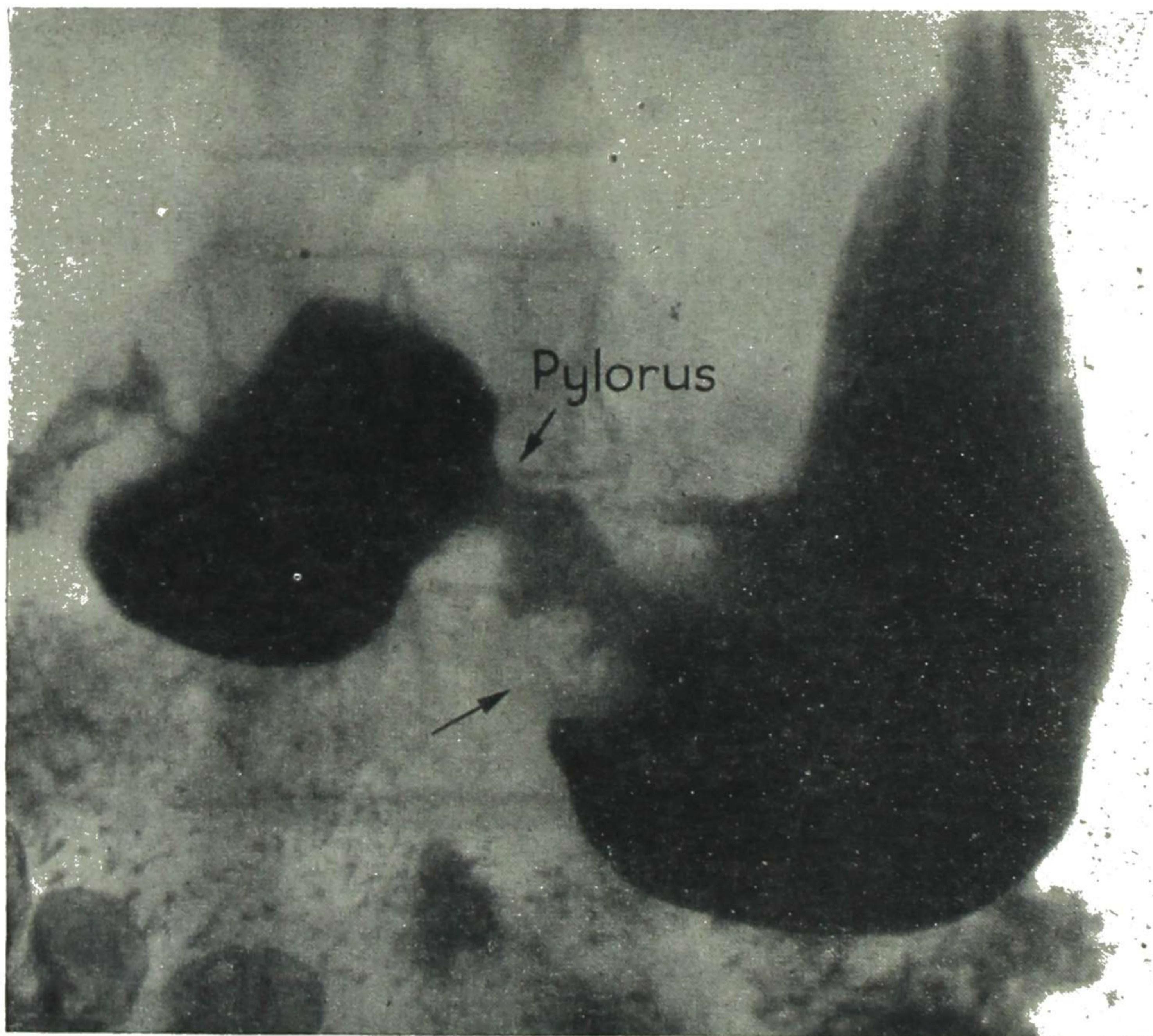


FIG. 73.—CANCER OF PYLORUS, filling defect (lower arrow).

Transmitted aortic pulsation, and slight fullness or rigidity of the upper end of the right rectus, may be present without a palpable tumour. When the cancer is deposited in the pylorus, it may cause adhesions which prevent the tumour from coming forward. The great majority of gastric tumours come forward to the left of the middle line. It is usually stated that whereas hepatic tumours move, gastric tumours usually do not move with respiration: but this feature has many exceptions. One of greater importance is the alternate appearance and disappearance of the tumour. At first it is extremely mobile, but later it becomes fixed by adhesions:

this is also the reason why perforation is rare. (xv.) Metastases occur in the pelvi-rectal pouch, in the ovary as a Krukenberg tumour, in the liver, or in the glands above the clavicles. In many cases, however, there are no symptoms referable to the stomach, and the diagnosis is only made at autopsy.

Etiology.—(1) Cancer of the stomach is more common in men. (2) It is rarely met with under forty, although cases occur under thirty. (3) Simple ulcer and chronic gastritis appear to predispose.

Diagnosis.—The disease should always be suspected when gastric symptoms first occur after the age of 40 years: and especially when there is only partial relief of the symptoms and the ulcer fails to heal on a strict ulcer régime. Radiology is essential if an early diagnosis is to be made. There is a characteristic irregular outline of the stomach wall, with rigidity, and defective or absent peristalsis. With cancer of the body, there is a tube-like stomach with food rushing through; in pyloric cancer there is obstruction and dilatation. Simple ulcers of the stomach are usually adjacent to the middle of the lesser curvature: many ulcers in the prepyloric area and all ulcers in the fundus and adjacent to the greater curvature are malignant. A fractional test meal may give a normal acid curve: often free HCl is absent, the total acidity is normal or low, and blood is present: organic acids (such as lactic acid) and also sarcinæ are present when there is gastric dilatation. The fæces show occult blood persisting even when the patient is on a strict ulcer régime. If emaciation be rapid, and gastric symptoms resist treatment, cancer should be strongly suspected. Gastroscoy is often helpful. *Dyspepsia* and *chronic gastritis* have pain directly related to food: for these, and *Simple ulcer* of the stomach, see Table XVII, p. 345. For Simple pyloric stricture, see Dilatation. *Tumour of the pylorus* or stomach has to be diagnosed from tumour in the neighbouring regions (§ 263). Thus a growth on the back of the stomach may resemble a kidney tumour. *Addison's disease* and other cachectic conditions must be excluded (Chapter XVI). *Pernicious anæmia* is sometimes strongly suggested by the colour of the patient, but in this disease there is not a corresponding amount of emaciation, and the blood-picture is different.

The *Prognosis* is very grave. The duration is rarely longer than six to eighteen months after the first definite symptoms appear. Death is the invariable result unless surgical measures are adopted early. The symptoms upon which one relies most in the diagnosis in these cases, anorexia and emaciation, appear to be those which also best measure the longevity of the patient. Death generally takes place by inanition, but almost as often it occurs suddenly by the involvement of important structures, and it would be unwise to assume that because the patient does not waste he will not die soon. Partial gastrectomy is successful if undertaken early, but of those diagnosed by X-ray and judged fit for surgery, only about half are capable of removal. A clinical diagnosis without X-rays and test-meal is rarely made early enough; the chance for successful treatment lies in the early investigation of cases of dyspepsia.

Treatment.—Early surgical treatment affords most hope of success. Apart from this the indications are to support the strength and relieve the symptoms. The former may be accomplished by easily digestible or predigested food (§ 297. XI), and by the use of pepsin and hydrochloric acid. For the latter consult § 295, Dilatation. For the flatulence and pain, give creosote and opium, or morphia hypodermically.

VIII. *The patient presents symptoms of CHRONIC INDIGESTION, and on physical examination there is SPLASHING, or the AREA OF THE GASTRIC RESONANCE is increased, or there are FOOD RESIDUES before breakfast.* The disease is probably GASTRIC DILATATION or ATONY.

§ 295. **Gastric Dilatation** may be due to two main causes, (a) Motor Insufficiency or Hypotonia; (b) Pyloric Obstruction.

(a) GASTRIC HYPOTONIA occurs independently of pyloric obstruction. There is delay in emptying the stomach, often associated with gastroptosis. The condition is most common in women of poor physique, between the ages of 30 and 50.

Symptoms.—(1) The patient is of the asthenic type with general loss of muscle tone, and often backache. There is vague dyspepsia, or discomfort in the upper or mid-abdomen, which is usually worse after meals. (2) Flatulence and aerophagy often accompany this dyspepsia. (3) True pain is absent. (4) Prolonged lassitude follows a moderate-sized meal. (5) A disinclination for food is often associated with some loss of weight and constipation. (6) Depression and anxiety are often superadded.

Physical signs.—(1) The tone of the abdominal wall is poor. (2) Gastric splashing or succussion can be demonstrated several hours after a meal (§ 276). (3) Food residues can be detected six or more hours after a previous meal, and in extreme cases a fractional test meal will show food residues in the fasting stomach juice next morning. (4) A barium meal examination affords a ready method of detecting the degree of gastric atony, and will measure the amount of gastric delay. (5) A fractional test meal usually shows a low acid content in the gastric juice, and delayed emptying.

Etiology.—(1) Acute infectious diseases such as typhoid, influenza and pneumonia contribute by virtue of their toxins. (2) Chronic states of general debility such as are associated with anæmia, tuberculosis and neurasthenia predispose. (3) An ill-balanced diet, with irregular meals and especially lack of vitamin B leads to defective muscle tone. (4) Depression and chronic anxiety states are potent predisposing factors. (5) There is a definite correlation between the motor activity of the stomach and the athletic capacity of the individual—lack of regular walking exercise is undoubtedly detrimental.

Diagnosis.—It is important to exclude organic disease in the body as a whole and in the stomach by a thorough physical examination and by a barium meal X-ray of the stomach. This will set a firm foundation for treatment, and will be especially reassuring to the patient.

Prognosis.—The disease is always troublesome and liable to relapse.

If diagnosed and treated early and thoroughly, and if contributing factors such as anæmia can be remedied, a cure is possible.

Treatment.—The indications are: (1) To keep the stomach as empty as possible. This may be done by diets No. I or VI, § 297. (2) Give concentrated or predigested foods with very little fluid. Little carbohydrate, not at the same meal as animal food, is preferable. (§ 297. Salisbury diet VI.) Give vitamin B in the form of wheat germ, a teaspoonful twice or thrice daily. (3) Promote digestion: vide § 284. (4) Adequate rest and sleep are essential: lying on the right side for $\frac{1}{2}$ –1 hour after the bigger meals promotes emptying of the stomach. (5) A lower abdominal support may aid. (6) Regular exercise, and local abdominal exercises, massage and faradism help to improve the hypotonia.

(b) In PYLORIC OBSTRUCTION there is difficulty in emptying the stomach due to organic obstruction in the prepyloric canal or at the pyloric sphincter. Radiology has demonstrated two distinct types: in the first, due to temporary or minor pyloric obstruction, the vigorous peristalsis of the stomach keeps the stomach largely empty, and of small size. In the second type, with more marked obstruction, peristalsis is largely absent and the stomach remains as a dilated sac containing many pints of fluid and food residues.

Symptoms.—*Early Cases.* (1) Gastric pain is present, due to exaggerated gastric peristalsis. It is often of colicky type (vide pyloric spasm, § 246). (2) Vomiting of relatively small amounts produces a vomitus containing partially digested food, with an acid reaction, but no bile. (3) Loss of weight and constipation largely depend on the amount of vomiting. (4) There are symptoms of the cause of the obstruction, e.g., duodenal ulcer, pyloric carcinoma. Physical examination may reveal (5) fullness in the left upper abdomen, (6) visible peristalsis (passing from left to right) in the epigastric region, which is more obvious after a meal and may be started by palpating or sharply flicking the abdominal wall. (7) A pyloric tumour may be felt. *Later cases.* (1) There is vomiting, particularly towards the end of the day, or at intervals of two or three days, of acid, sour-smelling, frothy material, on which a scum forms on standing. The quantity vomited may amount to several pints. (2) Decomposition and fermentation in the stomach give autotoxic symptoms and the symptoms of chronic gastritis: (3) loss of weight and constipation are marked: (4) dehydration may ensue. (5) In severe cases, tetany and alkalosis are sequelæ. Physical examination reveals, in addition to the wasting, (6) a dry tongue and poor volume pulse: (7) the distended atonic stomach may form a prominence in the left upper abdomen: (8) through a stomach tube, a large residue may be withdrawn.

Diagnosis.—To diagnose the cause and extent of the obstruction, X-ray examination is essential. If there is much gastric retention, the stomach may have to be emptied by a stomach tube, to prevent the barium emulsion being unduly diluted, and so obscuring the examination.

Etiology.—The causes are (1) spasm of the pyloric sphincter secondary

to a duodenal ulcer, and rarely as a reflex phenomenon due to other causes, *e.g.*, chronic appendicitis : (2) pyloric stenosis may occur from cicatrisation of a simple ulcer of the duodenal or prepyloric areas. (3) Obstruction due to a scirrhus cancer (§ 294). (4) Pressure from without, *e.g.*, enlarged glands in the portal fissure, or due to a band of adhesions, is rare. (5) For congenital hypertrophic pyloric stenosis, see § 271.

Treatment.—(1) The main indication is to treat the various causes of the condition. (2) Gastric lavage may be necessary as an adjunct to other treatment, or before operation : it may be carried out once or twice daily, and particularly in the evening. Normal saline, or water is best : add bicarbonate of soda (gr. 60– $\bar{0}$ i) or hydrogen peroxide (℥ 30– $\bar{0}$ i) to dissolve any mucus present. (3) To prevent fermentation, the symptoms of which are very troublesome, carbolic acid (1 to 3 minims), thymol (5 grains), or sodium sulphocarbolate (20 grains), are given preferably in a tumbler of water between meals. After lavage, calomel ($\frac{1}{8}$ grain t.i.d.) may be given with advantage. (4) Prevent dehydration by the administration of fluids rectally, subcutaneously or intravenously. (5) Inj. atropinæ gr. $\frac{1}{100}$, or tinct. belladonnæ, ℥ 10, 4–5 times a day, is most helpful in overcoming pyloric spasm. (6) Surgical treatment is essential in all cases of pyloric stenosis, of pyloric neoplasm producing obstruction, and in cases of pyloro-spasm not responding to medical measures.

§ 296. **Gastroptosis** is a condition in which the stomach has dropped from its position. The symptoms and signs are apt to be confused with Gastric Dilatation, with which it may be associated. The condition is often part of a general visceroptosis (§ 251), and is most clearly demonstrated by a barium meal. Intestinal stasis is usually also present, and hence an aggravated state of neurasthenia is frequently associated with the condition. *Treatment* is on the lines of visceroptosis (q.v.).

Dieteries and Invalid Foods ¹

§ 297. Less food is required in old age than in youth, and with a sedentary life than with an active or outdoor one. For a person in health three meals a day are usually sufficient ; but when a man is unable, from illness, to take more than a very small quantity at a time, he may require to take it more often. (Dietetic errors are a fruitful source of dyspepsia and gastritis. Too frequent meals, habitual over-feeding, bolting the food, and irregularity of the meals will in time derange any stomach. A diet lacking or deficient in vitamins (especially vitamin B) leads to atony of the muscles of the digestive canal. Vitamin B is supplied by wheat germ, yeast (marmite) and National bread. Deficiency of food, and long restriction to the same kind of food, induce dyspepsia by affording no stimulus to excite the secretions ; and in this connection it is well to remember that a frequent cause of failure on the part of the physician to cure dyspepsia is his disregard of this latter fact. In anæmic cases, starchy foods, especially potatoes and new bread, do not afford sufficient stimulus for the gastric functions ; proteins such as tender and underdone meat are more readily

¹ These diets are not designed to conform with food rationing.

digested. It is often a good rule to begin treatment by cutting down the amount rather than by entirely prohibiting the use of certain articles of diet. The frequent use of condiments, spices, strong tea, and of alcohol especially, leads to chronic gastritis; while dyspepsia is induced by imperfect mastication, bolting of meals, too much fluid with meals, hard mental or physical work immediately after eating, too cold or too hot food, or food which is badly prepared. Excess of tobacco-smoking and constipation are certainly causes of dyspepsia. Greasy and fried foods are bad in dyspepsia, because the gastric juice cannot penetrate the coating of fat. "Well-made" pastry and other so-called rich carbohydrate foods are a source of dyspepsia, especially when eaten at the same meal as protein.

Without appropriate dietetic rules our best efforts may fail, especially in the treatment of gastro-intestinal disorders, and other diseases which depend on the proper elaboration and assimilation of food. A few specimen dietaries are therefore given.

I. The following table is given as a guide to aid in the drawing up of a diet for mild cases of **dyspepsia** or **chronic gastritis**: *Breakfast*.—Boiled sole, whiting, or flounder; or a slice of crisp fried bacon or a soft-boiled egg; a slice of dry toast or of bread (not new) and butter. *Beverage*.—One cup of cocoa or of milk and water, sipped after eating. *Luncheon*.—Chicken or game, with bread, and a little tender, well-boiled vegetable, such as spinach, vegetable marrow, or young French beans. For sweets and dessert, a plain biscuit or milk pudding. *Beverage*.—Half a tumbler of water sipped *after* eating. *Afternoon Tea*.—A cup of marmite, bouillon, or of weak tea with milk, and a slice of wholemeal bread and butter. *Dinner* (two courses only).—Vegetable soup, fish of the kinds allowed for breakfast, without potatoes. Or a slice of any tender meat, such as saddle or loin of mutton, or the thick part of an underdone chop with crumbled stale bread; custard, junket or jelly, or a little well-stewed fruit. *Beverage*.—Half a tumbler of water, with from one to two tablespoonfuls of spirit if desired.

Condiments and stimulants are good in some forms of dyspepsia, but must be avoided in chronic gastritis, as tending to irritate the mucous membrane. The patient should abstain from salted and cured meats, tinned foods, sweets, pastry, raw vegetables, cheese (except cream cheese), fried foods, strong tea and coffee.

II. In **Superacidity** fried foods, game, vinegar, jam, condiments and alcohol should be avoided. The food should consist of soft, well cooked, finely cut up or minced, fish, meat, or poultry, eggs and cream cheese; fats, olive oil if it can be taken, plain butter not made into sauces, ice cream; mashed potato, rice, macaroni; weak tea—not coffee—or plain water, preferably after meals. Weak meat soups may be allowed. Milk is often difficult. If there is delay in the stomach, meals should be taken dry. Sometimes it is necessary to give food more frequently than three times a day. The patient should not sit at an ordinary table with others eating appetising food. *Early Morning*.—Weak tea without sugar, or tumbler of hot water. *Breakfast*.—Eggs (boiled, poached, fried or scrambled), cold ham or bacon, crisp toast, plenty of unsalted butter and a cup of weak tea after the food is taken. *Lunch*.—Fish or well-cooked meat which may be minced, little mashed potato, rice or macaroni, suet or baked custard or stiff milk pudding, toast, butter and cream, tumbler of water after food. *Tea*.—Cup of weak tea with milk and no sugar, little bread and butter or rusk and butter. *Dinner* as lunch, with addition of fruit juice or jelly. Half to one ounce of olive oil half an hour before lunch and dinner, if it can be taken.

III. **Peptic ulcer**. SIPPY DIET (modified). *First week*, or until the patient has been free of symptoms for at least 3 days: 3 oz. milk, citrated milk, milk and cream, or with a raw egg stirred in, each 2 hours while awake and an extra feed may be given at night. *Second week*.—Breakfast: 1 egg, 1 oz. toast, $\frac{1}{2}$ oz. butter, 4 oz. milk. Mid-

morning: glass of milk and rusk. Noon dinner: 2 oz. minced or pounded beef or chicken, 1 oz. toast, $\frac{1}{3}$ oz. butter. 2 p.m.: 1 egg in 3 oz. milk. 4 p.m. tea: 1 oz. thin bread and butter, without crusts, 3 oz. milk. 7 p.m. supper: 1 oz. well-boiled rice or macaroni, $\frac{1}{3}$ oz. butter, 1 oz. toast, 3 oz. milk. 9 p.m.: 6 oz. of Benger's, Allenbury's, etc. A tablespoonful of olive oil at 11.30 a.m. and 6.30 p.m. *Third to fifth weeks.*—Breakfast: egg (poached, boiled or scrambled), or steamed or boiled fish, toast, butter, milk. Midmorning: milk and biscuit. Noon: chicken or mince, mashed potato, dry toast, butter, boiled milk pudding. 2 p.m.: milk or egg and milk. Tea: toast or bread and butter, sponge cake, milk. 7 p.m.: steamed fish, toast and butter, macaroni or vermicelli, milk pudding, junket or custard. Bedtime: milk, Benger's, etc. Then a *post-ulcer diet.*—Breakfast: porridge, fish, cold fat ham, egg, toast, butter, cream, flavoured milk or weak tea. Dinner: chicken, tender mutton, lamb or beef, potato, sieved green or mashed root vegetables, milk or light steamed pudding, cream, cream cheese. Tea: bread and butter, sponge cake, milk and water or weak tea. Supper: fish, chicken or sweetbread, potato, sieved green vegetables, macaroni, milk pudding or milk shape, toast, butter, cream. In these diets with fresh milk, there is plenty of vitamin C; to avoid deficiency a little diluted orange juice may be given each day. On the whole, fruit is better avoided for several weeks, and should be as a purée, or as fruit juice alone, or in jelly.

HURST DIET. Mixture A. = Atropine Sulph. gr. 1/200: Aq. ad 60 min. Mist. Magnes. Hydrox. 60 min. may be added to milk feeds if needed as an aperient. *Strict diet.*—7.45 a.m.: Mixt. A. 60 min. 8 a.m.: 5 oz. milk, warm or cold, flavoured with tea and sugar to taste. Add Sod. citrate gr. 15. 9 a.m.: 5 oz. feed of arrowroot, cream of wheat, Benger's, junket, custard; to any of these can add red currant, apple or other fruit jelly; junket may be flavoured with chocolate. Salt may be added. Also 1 rusk and butter. 9.30 a.m.: olive oil $\frac{1}{2}$ oz. 10 a.m.: as at 8 a.m. 11 a.m.: as at 9 a.m. + 1 oz. cream. 12 noon: as at 8 a.m. 1 p.m.: 5 oz. thick soup or semi-solid purée of potato, artichoke, cauliflower or parsnip + 1 oz. cream. Rusk and butter. 2 p.m.: as at 8 a.m. 2.45 p.m.: Mixt. A. 60 min. 3 p.m.: as at 9 a.m. 3.15 p.m.: Magnes. or calcium tribasic phosphate 60 gr. in little water. 4 p.m.: as at 8 a.m. 4.30 p.m.: olive oil $\frac{1}{2}$ oz. 5 p.m.: as at 9 a.m. + 1 oz. cream. 6 p.m.: as at 8 a.m. 7 p.m.: as at 1 p.m. 7.15 p.m.: Magnes. or calcium tribasic phosphate 60 gr. in little water. 8 p.m.: as at 8 a.m. 9 p.m.: as at 9 a.m. 9.45 p.m.: Mixt. A. 120 min. 10 p.m.: as at 8 a.m. 10.15 p.m.: Magnes. or calcium tribasic phosphate 60 gr. in little water. Small quantities of water or sweetened orange juice and water may be drunk between meals. A feed of citrate and milk must be taken at night if in pain, and an extra dose of powder at any time if indigestion occurs. *Intermediate Ulcer diet* (for 2 or more weeks between strict diet and post-ulcer diet).—Every hour from 8 a.m. to 10 p.m. (except at 9 a.m. and 1, 5 and 7 p.m.): 4 oz. of a mixture of milk 2 pints, cream 5 oz., Sod. citrate gr. 120. At 9 a.m. and 5 p.m.: olive oil $\frac{1}{2}$ oz. and Mixt. A. 60 min.; weak milky tea; 1–2 lightly boiled, poached or scrambled eggs, thin bread and butter or toast. 1 p.m. and 7 p.m.: olive oil $\frac{1}{2}$ fl. oz. and Mixt. A. 60 min. Fish or chicken, mashed potato and vegetable purée, custard, junket, etc.

MEULENGRACHT DIET. Two-hourly feeds with four light meals a day. *Early morning*—milk or milky tea. *Breakfast*—strained oatmeal, porridge and milk, eggs, rusks, biscuits or bread (toasted), butter. *Mid-morning*—milk with rusk or biscuit, or milk soup with vegetable stock. *Mid-day*—minced chicken, rabbit, beef, mutton, pounded fish, or soufflé, brains, tripe or sweetbread; mashed potato, sieved spinach or greens or mashed carrot, parsnip or turnip; junket or milk pudding. *Tea*—milky tea, bread or biscuits, butter, jelly or honey. *Supper*—as at mid-day. *Bedtime*—milk with biscuit, ovaltine, Benger's or other invalid food. Milk in the night if awake.

IV. Diet for Cholecystitis and protective diet in convalescence from infective hepatitis. Plenty of protein with adequate carbohydrate is needed; fats should be restricted, only butter and milk fats being allowed. *Breakfast*—well-cooked porridge

4 oz., one egg with grilled bacon $\frac{1}{2}$ oz., or fish 4 oz. (except herring or mackerel); bread or toast 1 oz., butter $\frac{1}{3}$ oz., tea or coffee, skimmed milk¹ 6 oz.: 11 a.m.—skimmed milk 8 oz.: 1 p.m.—lean meat 4–6 oz., potato $1\frac{1}{2}$ oz., green vegetables, salads or roots to suit taste, cheddar cheese 1 oz., fruit 4–6 oz.: 4 p.m.—bread and butter $1\frac{1}{2}$ oz., plain cake 2 oz., tea, skimmed milk 6 oz.: 7 p.m.—clear vegetable soup, fish 4 oz., meat 6 oz., vegetables as at lunch, cheddar cheese 1 oz., fruit. *Bedtime*—skimmed milk 8 oz. Calories 2,200–2,500; protein 230–280 G; carbohydrate 200–250 G.; fat 80–90 G.

V. **Constipation.**—The first thing in the morning drink a tumbler of plain water, hot or cold, or eat an apple, pear, bunch of grapes, banana, orange, etc. *Breakfast.*—Coffee, not too strong, with a little milk; stone-ground flour or wholemeal bread with plenty of butter, honey or treacle; or well-cooked oatmeal, Kellogg's All-Bran or wheat germ, with cream or treacle. *Lunch.*—Sardines or olives in oil; fish, chicken or roast meat; vegetables, greens and salad; cream cheese, wholemeal bread and butter; fresh or stewed fruit with cream. *Tea.*—Coffee and milk, wholemeal bread, butter. *Dinner.*—Vegetable soup, fish or egg dish, vegetables and salads; suet pudding; fruit, wholemeal bread and butter. Lactose may be used instead of ordinary sugar. Cultures of *B. acidophilus* in milk can be taken once or twice a day. Fluids may be taken freely with meals, and half to one ounce of liquid paraffin or emulsion night and morning for a limited time. Some do better with bassorin or agar-agar preparations.

VI. The "**Salisbury**" diet consists of nitrogenous food only, the meals being taken almost without fluid, but a quantity of hot water being taken between meals. The solid food administered is in a highly concentrated form. Farinaceous and bulky substances are eliminated. By reason of the dryness and small bulk of the food, a dilated or atonic stomach is enabled to resume its normal dimensions. One pound (1 lb.) of lean butcher's meat, chopped or scraped very fine, so as to rid it of its white fibrous tissue, and lightly cooked, is taken per diem, divided into four or more meals. Occasionally a little well-toasted or twice baked bread is allowed also. For a change, $\frac{1}{2}$ pound of fish may be substituted for an equal quantity of meat. The meals are taken quite dry, or 2 ounces of fluid only; but two hours later $\frac{1}{2}$ pint of hot water is sipped.

VII. **Diet for Obesity** (§ 18).—The diet should be made up as far as possible from: Fish, eggs and meat (except as stated below); green vegetables, parsnips, carrots, turnips, celery, mushrooms, cauliflower, onions, tomatoes, beetroot or salad; stewed and fresh fruits. Bread, toast, rusks, water biscuits, butter, cream and cereals should be taken in small quantities only.

The following foods should be *avoided*: sugar, puddings, creams, cakes, sweet biscuits, shortbread, nuts and alcohol.

Take sparingly: salmon, herrings, pork, duck, bacon, savouries, rich sauces, potatoes, cheese, and made-up dishes such as pies, fricassées, rissoles, sausages and macaroni cheese, which are concentrated foods. So far as possible no fluid should be drunk during meals until all the solid food has been eaten.

The following is an example of a day's diet (weight in ounces). *Breakfast.*—Fish ($2\frac{1}{2}$ ounces), bacon (1) or cold ham (1), with 1 egg, or 2 eggs only; bread (1); butter ($\frac{1}{3}$); sugarless marmalade ($\frac{1}{2}$); milk (2); tea or coffee. *Lunch.*—Fish (4); or lean meat ($2\frac{1}{2}$); 2 vegetables ($2\frac{1}{2}$ of each), or salad (4); stewed fruit (3), or fresh raspberries, strawberries or gooseberries (6), plums, peaches, grapefruit or orange (5), cherries, apples, pears or grapes (4), banana or figs (2). *Tea.*—Bread or water biscuits ($\frac{1}{2}$); butter ($\frac{1}{6}$); sugarless jam ($\frac{1}{2}$); milk ($1\frac{1}{2}$); tea. *Dinner.*—Clear soup or soup made with vegetables only; fish ($1\frac{1}{2}$); meat, vegetables and fruit, as at lunch. Bovril or Marmite at bedtime. Caloric value = 1,250 (approx.).

VIII. **Diet in Nephritis.** (A) **Acute.**—A preliminary period of almost complete renal rest must be given, especially when anorexia or nausea is present. *Diet*:

¹ Can be made from Household Dried Milk.

Stage I. 1½ pints of fluid a day; water, barley water, Imperial drink, orangeade or lemonade with glucose added in the proportion of 4–6 oz. per pint, grape-juice or tomato-juice, and toffee if acceptable. This is continued until the hæmaturia has diminished, the blood pressure has fallen and the “critical diuresis” set in—usually a matter of three to four days; after this time the diet may be increased to *Stage II.* 2–2½ pints of fluid a day—milk ½ pint, weak tea, barley water, glucose-orangeade or lemonade, Imperial drink, 1 orange, 1 small tomato, grapes, stewed fruit, 2 oz. of wholemeal bread with *fresh* butter, 2 oz. of potatoes, porridge, milk puddings, honey, marmalade, jam, and ½ oz. of cream. (Fruit and vegetables to count as an equivalent weight of water.) After ten to fourteen days it is usually possible to increase further to *Stage III.* 3 pints of fluid a day—milk 1 pint, weak tea, barley water, orangeade or lemonade, Imperial drink, oranges, grapes, tomatoes, *ad lib.*, stewed fruit, milk puddings, cereal foods such as grapenuts, porridge, bread, cakes, fresh butter, cream, honey, jam, marmalade, steamed fish, potatoes, greens and salads. *Foods to be entirely forbidden:* Soups, bovril, beef-tea, liver, brains, sweetbread, alcohol, acid foods such as vinegar, and spices. *Foods to be avoided until œdema has disappeared:* Salt (in cooked food and at table). *To be avoided until blood pressure lowered:* Meat, bacon, ham and poultry.

(B) **Subacute Nephritis with Œdema.**—The total fluid intake, including fruit and vegetables, should not exceed the daily output of urine, but cannot be reduced below 35 oz. a day. Adexolin, 2 capsules, should be taken daily. Salt-free bread or same toasted 6 oz.; white fish, preferably fresh-water trout 6 oz.; mutton, veal, lamb, lean ham or chicken 10 oz.; skimmed milk flavoured with weak tea or coffee (1 pint a day); sugar, honey, jam, marmalade *ad lib.*, rice or other cereal 1 oz., made into milk pudding; flaked cereals *ad lib.*, grapes, tomatoes, apples, oranges, stewed fruit 10 oz.; salt-free butter ½ oz. a day. *Approximate Values*—Protein content, 150 G.; fat, 45 G.; carbohydrate, 300 G.; NaCl., 2.5–3.0 G.; calories, 2,100.

Karell Diet.—*Days 1–7.*—Milk, 7 oz., at 8 a.m., 12 noon, 4 p.m. and 8 p.m. Total salt is 1.3 G. *Day 8.*—Add at 10 a.m. a softly-cooked egg and one slice of toast. Total salt is 1.78 G. *Day 9.*—Add 2 oz. vegetables such as asparagus, celery, cauliflower or carrot, and two teaspoonfuls of cornflour to the milk taken at noon, to form milk soup. Add one slice of toast at 4.30 p.m. Total salt is 1.89 G. *Days 10–12.*—Add one egg, 1 oz. rice (weighed raw) and 2 oz. vegetables. Total salt is 2.41 G.

(C) **Chronic Nephritis with Blood Urea over 100 milligrammes per cent.**—Total fluid intake, 2½–3 pints per day: Weak tea, barley water, lemonade, orangeade, Imperial drink. Also glucose in the proportions of 4–6 oz. to the pint, with grape juice and tomato juice; cream, ½–1 oz. daily. After three or four days of such a régime, usually the blood urea has fallen to lower limits and then a higher protein diet should be given and a greater fluid intake should be possible.

Chronic Nephritis with Blood Urea over 80 milligrammes per cent.—Total fluid intake, 2½–3 pints of fluid daily, consisting of weak tea or coffee, milk (½ pint), lemonade, orangeade; bread or biscuits (5 oz.), butter (2 oz.), porridge or cereal foods such as flaked wheat or flaked rice (2 oz.), milk puddings, cream (1 oz.), cake; jam, honey or marmalade (½ oz.), sugar (2 oz.), green vegetables and salads *ad lib.*; potatoes (5 oz.), fish, meat or chicken (2 oz.), or one egg. *Approximate content:* Protein, 37 G.; fat, 69 G.; carbohydrate, 212 G.; calories, 1,600. *Unrestricted Foods:* Green vegetables, salads, fruits, sugar, honey, jam, arrowroot, butter.

Chronic Nephritis with Blood Urea between 40 and 80 milligrammes per cent.—Total fluid intake, 3–3½ pints a day (*i.e.*, average normal amount). Bread or cake or biscuits (10 oz.); milk (½ pint); white fish (4 oz.) or one egg; meat or chicken (3 oz.). *Unrestricted Foods:* Green vegetables, potatoes, salads, fruit, sugar, honey, jam, marmalade, oatmeal, cereal foods such as flaked wheat or flaked rice or other cereal preparations, milk puddings, butter, cream. *Approximate protein value* = 72 G.; *approximate caloric value*, 2,200. *Foods to be avoided:* Condiments, spices, meat extracts, brains, liver, sweetbreads.

IX. Diabetic Diets.¹—

	Diet A.	Diet B.	Diet C.	Diet D.
<i>Breakfast :</i>				
Tea or coffee	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>
Milk	2½ oz.	2½ oz.	2½ oz.	2½ oz.
Herring	1½ oz.	Nil	Nil	Nil
Bacon	Nil	½ oz.	1½ oz.	1½ oz.
Eggs	2	2	2	2
Tomatoes	7 oz.	7 oz.	7 oz.	7 oz.
Bread	1½ oz.	1½ oz.	1½ oz.	2 oz.
Orange	Nil	2½ oz.	2½ oz.	2½ oz.
<i>Dinner :</i>				
Soup—Hot water and Marmite or Bovril				
	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>
Lean meat	2 oz.	2 oz.	2 oz.	2 oz.
Potato	2½ oz.	3½ oz.	3 oz.	3½ oz.
Onions	3 oz.	Nil	1½ oz.	Nil
Butter or fat of meat	½ oz.	½ oz.	1 oz.	1 oz.
Bread	½ oz.	½ oz.	¾ oz.	Nil
Baked rice pudding	Nil	Nil	Nil	Milk 2½ oz., water 3 oz., rice ½ oz., saccharin or vanilla to taste.
Orange	2½ oz.	5 oz.	2½ oz.	2½ oz.
<i>Tea :</i>				
Tea	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>
Milk	2½ oz.	2½ oz.	2½ oz.	2½ oz.
Vita-weat biscuits . . .	1½	2	2	3
Butter	Nil	½ oz.	Nil	½ oz.
Cheese	1 oz.	1 oz.	1 oz.	1 oz.
Celery and Cress	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>	<i>Ad lib.</i>
Apple	2 oz.	2 oz.	2 oz.	Nil
<i>Supper :</i>				
Steamed fish	2 oz.	3 oz.	3 oz.	3½ oz.
Vita-weat biscuits . . .	3	2½	2½	4
Butter	Nil	½ oz.	¾ oz.	1 oz.
Custard	1 egg, 5 oz. milk, saccharin or vanilla to taste	Milk 5 oz., banana 2 oz., 1 egg, saccharin or vanilla to taste	Nil	As for Diet B
Rice pudding	Nil	Nil	Milk 5 oz., rice (uncooked) ¾ oz., vanilla or saccharin to taste	Nil
Rhubarb stewed with saccharin				
	<i>Ad lib.</i>	Nil	Nil	Nil
Carbohydrate	100 grammes	119 grammes	120 grammes	148 grammes
Fat	58 "	83 "	114 "	133 "
Protein	70 "	71 "	76 "	81 "
Calories	1,200	1,500	1,800	2,100

Alternative articles of food.—Any amount of the following may be taken in addition to the prescribed diet, as they contain very little food material: lettuce, celery, radishes, asparagus, cress, rhubarb, cranberries, green artichokes, mushrooms, lemons, horse-radish, cabbage, greens, spinach, French beans, seakale, cauliflower, scarlet runner, stewed gooseberries, cucumber.

Carbohydrate : The food value of 7 oz. tomato, 3 oz. onion, 2½ oz. orange, 1 oz. banana, and ½ oz. bread are approximately similar and represent one carbohydrate portion of 5 grammes (two half portions of different foods may be taken). These amounts in the diet list may be substituted for one another, or by:—

- 7 oz. of marrow, black currants, water melon, endive (raw), red currants, stewed greengages, damsons, plums, apricots, brussel sprouts, raspberries (raw), loganberries (raw);
- or 4 oz. of blackberries (stewed), turnips, leeks, Jerusalem artichokes, strawberries (ripe), apricots (ripe), stewed apples and pears;
- or 3 oz. of grapefruit, carrots, ripe cherries, peaches, gooseberries;
- or 2½ oz. of ripe greengages;
- or 2 oz. of beetroot, raw apple or pear, dried apricots or peaches, ripe plums;

¹ As used in the Diabetic Dept. of Charing Cross Hospital by Dr. R. A. Hickling.

- or 1½ oz. of parsnips, prunes (stewed), grapes ;
- or 1 oz. of potato, peas, broad beans ;
- or ¼ oz. of oatmeal (weighed dry), Force or Cornflakes ;
- or ½ oz. of rice or tapioca (weighed dry).

Instead of Vita-weat biscuits, you may take the same number of Huntley & Palmer's Breakfast Biscuits, Oval, Bath Oliver, Fancy Lunch, Cream Crackers, Fine Water, Oval Water, Thin Captain, Cornish Water, or Milk biscuits.

Protein : The food value of 1 oz. of lean meat or of Cheddar or Dutch cheese is approximately equivalent to 3 oz. steamed fish, and these may be substituted for one another, or in the amounts stated, by :—

- 1 oz. of the lean of roast beef, mutton, lamb, or by chicken, turkey, goose, game, rabbit, Cheddar or Dutch cheese. (The meat should be weighed cooked and bone not included.) ;
- or 1½ oz. of cod, skate, or dried haddock ;
- or 2 oz. of eels, sardines, well drained of oil ;
- or 3 oz. of sole, lemon sole, plaice, whiting, mackerel, hake, herring, haddock (fresh). (The fish should be weighed uncooked without skin or bone.)

Fat : Instead of butter, you may take :—

- An equal amount of dripping, margarine, oil, fat of meat, clotted (Devonshire) cream ;
- or Twice the amount of whipped cream ;
- or Four times the amount of thin cream.

Saccharin or vanilla may be used for flavouring any articles of food.

X. Milk Diet.—The basis of the diet is 8–10 oz. milk every 3 hours from 7 a.m. to 10 p.m., with additional feeds if the patient is awake in the night. The milk may be hot or cold, citrated, junket, or mixed with 2 oz. barley water or lime water, one tablespoonful of cream, or flavoured with vegetable soup stock, tea, coffee, cocoa, ovaltine, ground rice, sago, or one of the invalid foods, if there is no special contra-indication. The addition of 1 oz. bread, three rusks or plain biscuits, and ½ oz. of butter for some meals is allowed.

XI. Predigested Foods are indicated in dilatation of the stomach, cancer, and advanced cases of chronic gastritis. Benger's *Liquor Pancreaticus* is the usual ferment employed, because the pancreas contains both a proteolytic and a diastatic ferment. *Taka-diastase* is a valuable aid in the digestion of farinaceous foods. The patient takes it with his food at the commencement of the meal.

1. **Peptonised Milk.**—One pint new milk. One tube Fairchild's Zymine peptonising powder. Five oz. cold water. Method: Mix peptonising powder with cold water, add to milk heated to 105° F.; keep at this temperature for the time ordered (5 to 30 minutes). Bring rapidly to the boil to stop peptonising process.

2. **Peptonised Beef-Tea.**—Half a pound of finely minced lean beef is mixed with a pint of water and 20 grains of sod. bicarb.. This is simmered for an hour. When it has cooled down to a lukewarm temperature, the peptonising powder is added. The mixture is then set aside for three hours, and occasionally stirred. At the end of this time the liquid portions are decanted and boiled for a few seconds.

3. *Other foods* can be similarly prepared.

4. **Nutrient Enemata.**—Glucose alone is of practical use.

XII.—Beef-Tea.—Cut up a pound of lean beef into pieces the size of dice; put it into a covered jar with 2 pints of cold water and a pinch of salt. Let it warm gradually, and simmer for a couple of hours, care being taken that it does not boil.

XIII. Improved Beef-Tea.—Three-quarters of a pound of steak, scraped or passed through a mincing machine, and pounded; ¾ pint of cold water; one piece of sugar, one pinch of salt, one teaspoonful of tapioca; simmered in a "Gourmet Boila" for three hours.

XIV. Artificial Protein Foods.—Beef-tea and other meat preparations do not contain the nutritive constituents of meat, except in small quantities, but may be useful as

stimulants of gastric secretion. *Peptonised albumin* (or peptonised meat) is more nourishing, but the taste of peptone is very bitter and nasty. The *albumoses* are intermediate between albumin and peptone. They are freely soluble, tasteless, and readily digested and absorbed. *Plasmon* is another artificial protein food. It is prepared from milk, and contains casein in a soluble form. It is a nutriment of some value. * *Casein hydrolysate* can be given by mouth or intravenously.

XV. Diet for Oxaluria (after Poulton). Figures in brackets indicate oxalic acid content in mgm. per cent. Foods with high oxalic acid content must be *avoided*. Tea (1,380); cocoa powder (640); chocolate (90); sorrel (2,000); spinach (830); rhubarb (410); dry figs (100); beetroot and potatoes (40); parsnips (39); spring onions (55); red and black currants (70); bilberries and raspberries (42). Foods to be *taken sparingly* are: broad beans (39); French beans (20); lettuce (30); green peas (36); oranges (28); gooseberries (27). A smaller amount of oxalic acid is found in endive, tomatoes, strawberries, plums, carrots and beetroot. It is advisable also to avoid foods with high purin content.

XVI. Diet for Gout.—A low purin diet is essential: it is also advisable to exclude foods with a high oxalate content. Articles to be *avoided* are: chocolate, cocoa, strong coffee and tea, port, sherry, gin, burgundy, beer and stout, barley, oatmeal, shellfish, most meat—especially kidneys, liver, sausages, sweetbread, fish roe, caviare, rich sauces and pastry. Also broad beans, brussel sprouts, butter beans, haricot beans, lentils, peas, radishes, spinach, sorrel, raspberries and rhubarb. Foods *taken sparingly* include: simply cooked meat or fish, bacon rashers, mutton, poultry, ham, boiled ox tongue, oysters. Also cider, whisky and brandy. Fats can be taken in small amount: butter, cheese, cream, dripping, suet. Foods *allowed* include: milk, bread, eggs, milk puddings, fruit and vegetables (other than above), nuts, cereals, sugar, jam, honey, marmalade.

XVII. Routine Treatment of Sprue Cases (Hamilton Fairley).—

High Protein, Low Fat, Low Carbohydrate Diets.—Protein is largely supplied in the form of lean rump steak, which must be of the first quality. It is prepared by cutting away all skin, fat and gristle, mincing, and then lightly cooking in a dry pan for two to three minutes without the addition of any grease or water. It is continually stirred with a fork until the exterior is greyish in colour, and then rapidly removed and served hot. Much of the meat fibre is still raw, being cooked only sufficiently to render it palatable, in which form it is more readily digested. Rusks may be prepared from ordinary bread by baking thoroughly in an oven until crisp. Before doing so, all crust is removed. It is found that 2½ oz. of bread loses 1 oz. of moisture during the process. Heudebert unsweetened rusks—*biscottes de pain grillé*—are also excellent. When available in the Tropics, ripe papaya may be used either as a substitute for, or in addition to, orange juice in all these diets.

High Protein Diet, No. 1. (Calorie value = 770.) 8 a.m.—Underdone beef, 3 oz.; rusks, ¾ oz.; juice of ½ orange; and glucose, ¼ oz. 12 a.m.—Soup, 4 oz. + liver extract (= ⅝ lb.); underdone beef, 3 oz.; rusks, ¾ oz.; juice of ½ orange; and glucose, ⅓ oz. 6 p.m.—Ditto, 12 a.m. Protein: fat: carbohydrate = 1.0:0.3:1.2. *Note*.—Where patients are very ill, two hourly feeds of meat and beef juice can be substituted.

High Protein Diet, No. 2. (Calorie value = 1,280.) 8 a.m.—Underdone beef, 5 oz.; rusks, 1 oz.; calves-foot jelly, 2 oz.; juice of 1 orange + glucose, ¼ oz. 12 noon—Soup, 4 oz. + liver extract (= ⅝ lb.); underdone beef, 5 oz.; rusks, 1 oz.; juice of 1 orange + glucose, ¼ oz. 4 p.m.—Tea, 10 oz.; milk, 2 oz. 7 p.m.—Ditto, 12 noon + calves-foot jelly, 2 oz.. Protein: fat: carbohydrate = 1.0:0.3:1.0.

High Protein Diet, No. 3. (Calorie value = 1,820.) 6 a.m.—Tea, 10 oz.; milk, 2 oz. 8 a.m.—Underdone beef, 6 oz.; rusks, 1½ oz.; calves-foot jelly, 2 oz.; juice of 1 orange + glucose, ¼ oz. 10 a.m.—1 baked apple; custard, 1 oz. 12 noon—Soup, 4 oz. + liver extract (= ⅝ lb.); underdone beef, 6 oz.; calves-foot jelly, 2 oz.; rusks, 1½ oz.; juice of 1 orange + glucose, ¼ oz. 4 p.m.—Tea, 10 oz.; milk, 2 oz.;

baked apple, 1 oz.; custard, 1 oz. 7 p.m.—Ditto, 12 noon. Protein : fat : carbohydrate = 1.0 : 0.32 : 1.3.

High Protein Diet, No. 4. (Calorie value = 2,200.) 6 a.m.—Tea, 10 oz.; milk, 2 oz. 8 a.m.—Underdone beef, 7 oz.; rusk, 1½ oz.; calves-foot jelly, 2 oz.; juice of 1 orange + glucose, ¼ oz. 10 a.m.—1 baked apple + custard, 2 oz. 12 noon.—Soup, 5 oz. + liver extract (= ⅝ lb.); underdone beef, 7 oz.; calves-foot jelly, 2 oz.; rusks, 3 oz.; juice of 1 orange + glucose, ¼ oz. 4 p.m.—Tea, 10 oz.; and milk, 2 oz.; 1 baked apple; custard, 3 oz. 7 p.m.—Ditto, 12 noon, but only 1½ oz. of rusk allowed. Protein : fat : carbohydrate = 1.0 : 0.34 : 1.3.

Convalescent Sprue Diet.

Breakfast (8 to 9 a.m.).—Lightly boiled or poached eggs; underdone lean chop or steak; filleted, boiled or steamed fish—whiting, sole, plaice, haddock; thin toast, and butter in moderation; weak tea; stewed fruit: apples, rhubarb; honey or jam in small quantity; also butter. 11 a.m.—½ pint of milk, if desired, and if it agrees. *Lunch.*—Chicken or vegetable soup; underdone grilled steak; roast or boiled chicken; liver cooked in various ways; cold beef or mutton, but fat not to be eaten. Vegetables: spinach, marrow, cauliflower, French beans, celery, young peas, boiled onions; salad of lettuce and tomato; boiled potatoes in small quantity. Custard, junket, milk jellies, and jelly with fruit, such as bananas, etc. Baked apples. Small quantity of cream allowed. Fresh fruits such as oranges, Canary bananas, pears, peaches, grapes, raspberries, strawberries, melons, grapefruit. Rusks or toast allowed. *Tea, 4 p.m.*—Weak China tea, Madeira cake or sponge cake, dry toast and butter, Marie or water biscuits. *Dinner, 7 p.m.*—Chicken, rabbit, brains, sweetbread, tripe, cold lean meat; lettuce and tomato salad or other vegetables mentioned, but no potatoes; custard, junket, baked apple, stewed fruit or fruit in jelly, and a small quantity of fresh cream; rusks or toast and butter allowed.

Articles to be avoided.—Avoid overdone and twice-cooked meat and articles fried or cooked in fat. Condiments, like pepper, mustard, chillies, sauces, chutneys, curries and spiced food. Game, duck and fat fish, such as salmon, trout, mackerel and herrings. Fresh bread, grease, fat, salad oil dressings and sauces of all kinds, suet puddings, cakes with icing, raisins and pastry. Sweets and chocolates. Alcoholic drinks and mineral waters.

Note.—Smoking in moderation is allowed once convalescence has been established.

XVIII. **Diet in fevers** should consist mainly of nourishing fluids, water, barley-water, orangeade or lemonade with glucose (1–2 oz. per pint), lemon and barley-water, weak tea and Imperial drink allowed *ad lib.*, with milk (½–2 pints daily), egg and milk, oxo, bovril, meat or chicken broth, calves-foot jelly. Especially if there is high fever or much sweating, the total fluid intake should be 3–5 pints daily. Milk may be diluted with half to two-thirds of water, soda-water, or barley-water. If curds are passed, the milk may be peptonised, or sodium citrate may be added in the proportion of gr. 2 to the ounce of milk. Lime-water may be used instead if diarrhoea be present. If milk is not well tolerated, whey or cream may be given, or the yolks of eggs or egg-flip. Where intestinal infection is present, meat extracts and jellies are better avoided. Some invalid foods are given below. Iced water is agreeable, but generally increases the thirst.

XIX. **Milk, Egg, and Brandy.**—Scald some new milk, but do not let it boil. Put it into a jug, and the jug into a dish of boiling water. When the surface looks filmy, it is sufficiently done, and should be put away in a cool place in the same vessel. When quite cold, beat up a fresh egg with a fork in a tumbler, with a lump of sugar; beat quite to a froth, add a dessertspoonful of brandy and fill up the tumbler with scalded milk.

XX. **Imperial Drink.**—Acid potassium tartrate 60 grains, oil of lemon 3 drops, flavoured with sugar, or saccharine 1 grain, and dissolved in a pint of boiling water.

XXI. **Whey.**—Into a vessel of warm milk put sufficient quantity of rennet to cause curdling, and strain off the liquid, which is then ready for use.

XXII. **Sherry Whey** (especially good for infants with summer diarrhœa).—Half a pint of milk is boiled: as soon as it boils, add $2\frac{1}{2}$ fluid oz. of good cooking sherry; allow the mixture to boil for a few minutes, then leave in a cool place in a basin. When the curd falls to the bottom, carefully pour off the whey, or strain through muslin. In grave conditions, with vomiting, give a teaspoonful every ten minutes; in inflammatory diarrhœa give a tablespoonful every hour.

CHAPTER XI

THE INTESTINAL CANAL

THE physiological importance of the intestinal canal is evidenced by the fact that its length is between 25 and 30 feet, along the whole of which absorption may take place; yet the first feature of intestinal disorders which strikes the student is their inaccessibility to examination. Healthy individuals often show considerable variations in the size, length and position of the large intestine; on the other hand, dilatation and redundancy of the colon may be associated with disease. Micro-organisms or their toxins can make their way through the mucous membrane of the intestine into the lymph spaces beneath, and thence into the glands and the circulation, particularly when the mucous membrane is unhealthy, abraded, or ulcerated. The bacteriology and the chemistry of the intestinal contents are now assuming much importance and the examination of the stools is necessary in every complete investigation of a patient. X-ray examination after a barium meal has thrown much light on the nature of the intestinal movements. In the small intestine they are churning in character and result in a to-and-fro or pendulum action, with a peristaltic wave over a short length of intestine at intervals. The residue from the small intestine slowly fills the cæcum and ascending colon to the neighbourhood of the hepatic flexure. At intervals, usually after a meal (gastro-colic reflex), the mass of contents of the cæcum and ascending colon is rapidly passed through the remainder of the colon and evacuated, though usually a small residue remains in the sigmoid until the next mass movement takes place.

Another striking feature about diseases of the intestines is the disproportionate amount of prostration which accompanies them. When a patient is attacked by a slight but sudden diarrhœa or abdominal pain, the feeling of exhaustion, which in some cases may amount almost to collapse, is out of all proportion to the local mischief. This disproportionate degree of prostration or collapse is especially seen in early life, when "diarrhœa" is, mainly on this account, found to be one of the chief causes of death in children under two years of age. Again, among the acute specific fevers fatal collapse and prostration often occur in those in which the chief lesion is in the intestinal canal—in cholera, dysentery, and typhoid fever. This may be due in part to the large vascular bed in the abdominal cavity, and to the extensive surface through which toxins can be absorbed.

PART A. SYMPTOMATOLOGY

§ 301. The cardinal symptoms of intestinal disorder are ABDOMINAL PAIN, DIARRHŒA, CONSTIPATION, and INTESTINAL DISCOMFORT.