VI. THE PEPTIC ULCER—GASTRIC AND DUODENAL.

The round, perforating or simple ulcer is usually single and occurs in the stomach and in the duodenum as far as the papilla biliaria. It probaably follows nutritional disturbance in a limited region of the mucosa, which results in the gradual destruction of this area by the gastric juice. The condition is usually associated with hyperacidity.

Etiology.—Clinically the simple ulcer is not so frequent as the statistics of post-mortems would lead us to expect; thus in the extensive records collected by Welch, ulcer, cicatrized or open, was present in about five per cent of persons dying from all causes. The scars are found more frequently than the open ulcer.

Females are more frequently affected than males. Of 1,699 cases collected from hospital statistics by Welch, and examined post mortem, 40 per cent were in males and 60 per cent were in females. He gives the age incidence in 607 cases, of which three fourths were distributed between the ages of twenty and sixty, with tolerable uniformity in the four decades. In females the largest number of cases occurs between twenty and thirty; in males, between thirty and forty. Ulcer occasionally occurs in children, and Goodhart has reported a case in an infant thirty hours old. Gastric ulcer is stated to be less common in this country than in Europe.

In women it is frequent among servant girls, and in men who follow such occupations as shoe-making, weaving, and tailoring, possibly connected, as Habershon suggested, with pressure on the stomach. This view has been developed by Rasmussen, who holds that pressure of the costal margin, from various causes, induces anæmia and atrophy of the mucous membrane, particularly in the region of the smaller curvature. Very rarely the disease originates from traumatism or the action of corrosive fluids. Gastric ulcer is associated in a special manner with certain diseases, in women with anæmia and chlorosis and with menstrual disorders. It is not infrequently met with in tuberculosis. Such cases are not, however, to be mistaken for the true tuberculous ulcer, which may be found in the stomach.

Many cases have occurred in connection with disease of the heart or of the blood-vessels, a relation of special interest in connection with the embolic theory of its production.

The duodenal ulcer is less common than the gastric ulcer, and occurs most frequently in males. The combined statistics of Krauss, Chvostek, Lebert, and Trier give 171 cases in males and 39 in females. In 9 cases which have come under my observation 7 were in males and 2 in females; one of these was in a lad of twelve. It has been found in association with tuberculosis, and may follow large superficial burns.

Morbid Anatomy.—Though usually single, the ulcers may be multiple. In none of my cases were there more than five, but there is an instance

on record of thirty-four. The ulcer is situated most commonly on the posterior wall of the pyloric portion at or near the lesser curvature. It is not nearly so frequent on the anterior wall. Of 793 cases collected by Welch from hospital statistics, 288 were on the lesser curvature, 235 on the posterior wall, 95 at the pylorus, 69 on the anterior wall, 50 at the cardia, 29 at the fundus, 27 on the greater curvature. The duodenal ulcer is usually situated just outside the ring in the first portion of the gut.

The ulcer varies from 1 to 10 cm. in diameter. It may be small and punched out, or it may reach an enormous size. The largest of which I have any knowledge is one reported by Peabody, which measured 19 by 10 cm. and involved all of the lesser curvature and spread over a large part of the anterior and posterior walls. The ulcer is usually round or oval in shape, but may be irregular with sinuous borders. It is often distinctly terraced. In acute cases the mucous membrane is sharply cut, as if punched out by an instrument. In old cases the edge is indurated and loses the sharp margin. The floor is formed either by the submucosa, by the muscular layers, or, not infrequently, by the neighboring organs, to which the stomach has become attached. In the healing of the ulcer, if the mucosa is alone involved, the granulation tissue develops from the edges and the floor and the newly formed tissue gradually contracts and unites the margins, leaving a smooth scar. In larger ulcers which have become deep and involved the muscular coat the cicatricial contraction may cause serious changes, the most important of which is narrowing of the pyloric orifice and consequent dilatation of the stomach. In the case of a girdle ulcer, hour-glass contraction of the stomach may be produced. It is probable that large ulcers persist for years without any attempt at healing.

The ulcer may deepen and penetrate the coats. Fortunately, in a majority of the cases, adhesions form between the stomach and adjacent organs, particularly with the pancreas, the left lobe of the liver, and the omental tissues On the anterior surface of the stomach adhesions do not so readily form, hence the great danger of the ulcer in this situation, which more readily perforates and excites a diffuse and fatal peritonitis. On the posterior wall the ulcer penetrates directly into the lesser peritoneal cavity, in which case it may produce an air-containing abscess with the symptoms of the condition known as subphrenic pyo-pneumothorax. In rare instances adhesions and a gastro-cutaneous fistula form, usually in the umbilical region. Fistulous communication with the colon may also occur, or a gastro-duodenal fistula. There are several instances on record of perforation into the pericardium, and at least two of rupture into the left ventricle. Perforation into the pleura may also occur. It is to be noted that general emphysema of the subcutaneous tissues occasionally follows perforation of a gastric ulcer.

One of the most serious effects of gastric ulcer is erosion of blood-vessels. The hæmorrhage may occur in the acutely formed ulcer or in the

ulceration which takes place at the base of the chronic form; it is in the latter condition that the bleeding is most common. Ulcers on the posterior wall may erode the splenic artery, but perhaps more frequently the bleeding proceeds from the artery of the lesser curve. In the case of duodenal ulcer the pancreatico-duodenal artery may be eroded or (as in one of my cases) fatal hæmorrhage may result from the opening of the hepatic artery, or more rarely the portal vein. Interesting changes occur in the vessels. Embolism of the artery supplying the ulcerated region has been met with in several cases; in others diffuse endarteritis. Small aneurisms have been found in the floor of the ulcers by Douglas Powell, Welch, and others.

The mode of the origin of the peptic ulcer has been much discussed. Ulcers have been produced in animals in many ways, both by artificial emboli and by direct chemical and mechanical irritants applied to the mucosa. The ulcers thus produced heal with great rapidity unless the animals have been rendered anæmic by repeated abstraction of blood. Virchow's view that the process may result from plugging the nutrient artery of the part, either by an embolus or by a thrombus, and the infarct so produced is destroyed by the gastric juice, has gained general acceptance. It is in conformity with Pavy's well-known experiments and with the anatomical facts already mentioned, particularly with the funnel-like shape of the ulcer, and the actual demonstration, in some cases, of the plugged vessels; but this view scarcely meets all the cases, in many of which the etiology is still obscure. Mere mechanical injury to the mucous membrane is, however, in most cases, insufficient cause for an ulcer, for normally the stomach is perfectly able to withstand such insults. Ewald concludes that certain predisposing causes play an important *rôle* in its development. He points to its frequency in conditions of amenorrhœa, chlorosis, anæmia after confinements, etc., where one may assume that the condition of the blood is not wholly normal, and also to the fact that in the majority of cases of this affection there is a hyperacidity of the gastric juice. One or both of these predisposing factors seem to be present in most cases, and it has been recently shown that in the various anæmiæ there is an appreciable diminution in the normal alkalinity of the blood, a fact which tends to explain one of the predisposing causes in these affections, and which is in accord with the "alkalescence theory" of Cohnheim *et al.* The duodenal ulcer has an identical origin, but a few cases of acute ulcer, as already mentioned, have a curious relation with superficial burns. In one of my cases there was an ulcer in the posterior wall of the duodenum, 1·5 cm. in diameter, with overlapping edges, and not far from it was a cyst-like cavity in the submucosa associated with Brunner's glands, and it is possible that the open ulcer, with undermined edges, resulted from the rupture of one of these cysts.

Symptoms.—The condition may be met with accidentally, post mortem, in cases which have presented no indication of gastric disturbance.

In other instances the first symptoms may be due to perforation. In others again the symptoms, for months and years, may be those of ordinary dyspepsia, and the ulcer may not have been suspected until the occurrence perhaps of a sudden hæmorrhage.

The symptoms suggestive of peptic ulcer are: (*a*) Dyspepsia, which may be slight and trifling or of a most aggravated character. In a considerable proportion of all cases nausea and vomiting occur, the latter not for two or more hours after eating. The vomitus usually contains a large amount of HCl.

(*b*) Hæmorrhage is present in at least one half of all cases. It may be slight, but more commonly is profuse, and may be in such quantities and brought up so quickly that it is fluid, bright red in color, and quite unaltered. When the blood remains for some time in the stomach and is mixed with food it may be greatly changed, but the vomiting of a large quantity of unaltered blood is very characteristic of ulcer. Syncope may follow or death may directly result from the hæmorrhage. A most extreme grade of anæmia may be produced. In either the gastric or duodenal ulcer, more commonly in the latter, the blood may be passed in the stools and not be vomited. This may occur when the hæmorrhage is slight, but also when it is profuse enough to produce collapse and extreme anæmia.

(*c*) Pain is perhaps the most constant and distinctive feature of ulcer. It varies greatly in character; it may be only a gnawing or burning sensation, which is particularly felt when the stomach is empty, and is relieved by taking food, but the more characteristic form comes on in paroxysms of the most intense gastralgia, in which the pain is not only felt in the epigastrium, but radiates to the back and to the sides. These attacks are most frequently induced by taking food, and they may recur at a variable period after eating, sometimes within fifteen or twenty minutes, at others as late as two or three hours. It is usually stated that when the ulcer is near the cardia the pain is apt to set in earlier, but there is no certainty on this point. The attacks may occur at intervals with great intensity for weeks or months at a time, so that the patient constantly requires morphia, then again they may disappear entirely for a prolonged period. In the attack the patient is usually bent forward, and finds relief from pressure in the epigastric region; one patient during the attack would lean over the back of a chair; another would lie flat on the floor, with a hard pillow under the abdomen. Pressure is, as a rule, grateful. It has been thought that the posture assumed during the attack would indicate the site of the ulcer, but this is very doubtful.

(*d*) Tenderness on pressure is a common symptom in ulcer, and patients wear the waist-band very low. There may be a painful point of very limited extent, most frequently an inch or two below the ensiform cartilage. In old ulcers with thickened bases an indurated mass can usually be felt in the neighborhood of the pylorus. Pressure should be made