TUMORS OF THE STOMACH

Arthur Purdy Stout, M. D.
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ATLAS OF TUMOR PATHOLOGY

Section VI—Fascicle 21

TUMORS OF THE STOMACH

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TUMORS OF THE STOMACH

INTRODUCTION

The importance of carcinoma among tumors of the stomach is so great that one is tempted to dismiss with a mere enumeration of their names and numbers most of the other tumors which are known to grow there. It would be wrong to do so, for those concerned in diagnosis and treatment cannot proceed with intelligence to meet the unexpected and the unusual unless they are armed with the knowledge of how the tumors may appear and what effects they can produce. This information is especially important for the pathologists who may be called upon to make a quick diagnosis by frozen section. Therefore an apparently disproportionate amount of space in this fascicle is devoted to the rare and unusual tumors.

In oncology are found many peculiar and unexplained facts: None is more bizarre than the distribution of tumor varieties in terms of frequency. The best known and most challenging of these facts is the enormous difference between the relative frequency of carcinoma of the stomach compared with the rarity of carcinoma of the duodenum. This striking fact is further emphasized by the extreme infrequency with which gastric carcinoma invades and replaces the surface of the duodenal mucosa, although it has no such respect for the deeper components of the duodenal wall. Then, too, it is impossible to avoid speculating why adenomatous polypoid growths should be so common in the large bowel and rectum and so rare in the stomach when carcinomas are equally common in both of these portions of the alimentary tract. Why, too, should the mesodermal tissues of the gastric wall, with the possible exception of the smooth muscle, so rarely develop into tumors that in other parts of the body are common? A reference to table I showing the actual numbers of the various tumors of the stomach recorded in the Laboratory of Surgical Pathology of Columbia University will emphasize this. It has been suggested (Sulc; Laidlaw and Murray) that hemangiomas are common in the skin because they are atavistic vestiges reproducing in man the vascular organs for gaseous exchange found in the skin of species which have no lungs. If this is true it is possible that the absence of historical phylogenetic variations may be offered as a partial explanation for the rarity of mesodermal tumors in the stomach. Ontogenetic errors are responsible for very few gastric tumors so far as is known. They are confined chiefly to the occurrence of pancreatic and duodenal
glands in the gastric wall. These glands may become large enough to form small gross nodules (figs. 12-14). Whether or not such buried epithelial cells can develop into malignant tumors is unknown. It has been suggested that they may account for the limitis plastica variety of carcinoma, since this unusual tumor form seems to be largely confined to the deeper layers of the gastric wall; and if the mucosa is involved, it is in its deeper portion, as though the tumor were invading it from the deeper tissues, rather than growing into the wall from the mucosa as in all other varieties of gastric carcinoma.

### Table I

651 TUMORS OF THE STOMACH  
Laboratory of Surgical Pathology, Columbia University  
April 1, 1908 to March 31, 1950

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<th>Malignant</th>
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<td>Epithelium of mucosa</td>
<td>Carcinoma (72.2%) 470</td>
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<td>Heterotopic tissues</td>
<td>Carcinoid 4</td>
</tr>
<tr>
<td>Muscular elements</td>
<td>Leiomyosarcoma 24</td>
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<td>Rhabdomyosarcoma 1</td>
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<td>Vascular elements</td>
<td>Kaposi's sarcoma 1</td>
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<td>Lymphoid elements</td>
<td>Lymphosarcoma 35</td>
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<td></td>
<td>Hodgkin's disease 4</td>
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<tr>
<td></td>
<td>Plasmocytoma 2</td>
</tr>
<tr>
<td>Fatty elements</td>
<td>No Cases</td>
</tr>
<tr>
<td>Nervous elements</td>
<td>No Cases</td>
</tr>
<tr>
<td>Connective tissue</td>
<td>Fibrosarcoma 0</td>
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**Etiology of Carcinoma**

The etiological factors leading to the development of stomach carcinoma would be of great importance if they were known. It is certain that adenomatous polyps may become carcinomatous, but there are so few of them that they can account for but extremely few cancers. Similarly, hypertrophic or polypoid gastritis and the atrophic changes in the gastric mucosa associated with pernicious anemia have both been considered precancerous. Even if
This is true they are both so uncommon that they can play a part in the development of exceedingly few carcinomas. Pernicious anemia is featured by atrophic gastritis but is by no means the most common cause of this interesting condition. It has been shown that with advancing age the stomachs of many individuals show certain changes in the mucosa, especially of the antrum and pylorus along or adjacent to the lesser curvature. The most striking of these changes is first a conversion of the gastric pits into tubes lined by epithelial cells characteristic of the crypts of Lieberkühn. This process is known as intestinal metaplasia, and in severe cases the gastric glands disappear entirely, leaving only these intestinal type crypts. The second change is the extension of the antral type of mucosa into the fundus for short distances; and the third change consists of the formation of microcysts in the antral and pyloric mucosa (figs. 3, 4). The secretion of acid and gastric ferments in such stomachs may be elevated, normal, or decreased. It has been both asserted (Warren and Meissner) and denied (Guiss and Stewart) that such changes are precancerous. It is true that atrophic changes are very frequent and often marked in stomachs with cancer; but it is difficult to prove that this change is greater and more extensive than is to be expected in individuals of comparable age without cancers, for it is generally accepted that this atrophic change tends to appear in progressively greater extent and frequency with advancing years. It is also hard to prove that carcinomas have developed from glands showing intestinal metaplasia (fig. 6). One is therefore left in doubt about the precancerous importance of atrophic changes in the gastric mucosa.

The relationship of carcinoma of the stomach to chronic peptic ulcer has been hotly debated far beyond its importance. There can be no doubt about the possibility of the coexistence of benign peptic ulcer and carcinoma in the same stomach, but it is equally certain that this is a rare event. Among 470 stomachs resected for carcinoma at the Presbyterian Hospital, N. Y., a chronic peptic ulcer of the penetrating type was found in 34 (7.2 percent). In six of these (1.2 percent) the ulcer was in a different part of the stomach from the carcinoma. In 28 (6 percent) a deep penetrating ulcer which had all of the attributes of a benign peptic ulcer was found to have carcinoma along one margin or completely surrounding the edge, without involvement of the base.

Whatever one chooses to believe about the relationship between these two conditions, whether the carcinoma developed alongside a preceding peptic ulcer or whether peptic ulceration destroyed part of the cancer, leaving only a remnant around its margins (and possibly both processes take place in different individuals), the association is so uncommon that benign peptic ulcer of the stomach cannot be regarded as a precancerous lesion. What is of extreme importance is the fact that it is not always possible by any of the clinical diagnostic procedures at our disposal surely to distinguish the benign from the malign-
nant ulcer of the stomach. It can be stated with assurance that if either hypochlorhydria or achlorhydria is found in patients with gastric ulceration the lesion is more likely to be a carcinoma than a simple peptic ulcer. The reverse is true if there is marked hyperchlorhydria. Gastroscopy, with or without biopsy, investigation with the roentgen ray, variations in electrical potential as shown in the electrogastrogram, and the search for exfoliated cells in gastric washings are all important aids; but none of them is decisive in every case. This need cause no surprise since it is just as difficult for the pathologist with the stomach in his hands always to differentiate between benign and malignant ulceration; and sometimes it is necessary to wait for microscopic examination of multiple sections before diagnosis is certain.

An idea of the relative frequency of the different kinds of gastric neoplasms can be gained from table I, which shows the numbers and kinds of gastric tumors examined in the Laboratory of Surgical Pathology, Columbia University, during a 42-year period. Almost all of these were removed by surgery. The number of benign lesions is probably too high because the only carcinomas counted were those removed by gastric resections. But it is very obvious that even with the inoperable carcinomas excluded, the benign tumors formed only 16.5 percent of the total, and almost all of them were either adenomatous polyps or leiomyomas. It is equally apparent that almost all of the malignant tumors were carcinomas.

References


Sulc. Quoted by Samberger.


Gastritis

It seems inevitable that the subject of gastritis should be discussed and illustrated in connection with adenomas and carcinomas of the stomach because of the possible relationship existing between the glandular epithelial changes seen in gastritis and the development of carcinoma. Figures 1 and 2 show the microscopic appearance of relatively normal mucous membrane in the antral-pyloric zone and in the fundus. In both areas there are gastric pits lined by mucus-secreting glands; but whereas the pits in the fundus are very short, in the antrum and pylorus they fill the superficial half of the mucosa. In both regions gastric glands fill in the space between the pits and the continuous layer of smooth muscle called the muscularis mucosae; but whereas in the fundus these contain many chief and parietal cells, in the antrum and pylorus there are only a few of these sparsely scattered. Thus the acids and ferments are secreted chiefly in the fundus and but insignificant amounts are formed in the antrum, which is the region where food is prepared for propulsion through the pylorus. The fundic type of mucosa is continued almost to the esophagus but is interrupted for a short distance close to it, where mucosa resembling that seen in pylorus reappears to distinguish the cardia.

The changes of importance in relation to cancer are found especially in the antral and pyloric mucosae. They consist first in an alteration of the character of glands. The gastric pits become lengthened and the cells lining them change from the gastric to the intestinal type; the nucleus and cyto-
NORMAL GASTRIC MUCOSA

Figure 1.* Normal aniral mucosa of stomach. At left the full thickness of the gastric wall is shown. The gastric pits form more than half the thickness of the mucosa with the gastric glands beneath them. The protective layer of mucus on the surface has been artefactually detached. At the right is a detail of the gastric glands. No chief or parietal cells are seen. X 425. A. F. I. P. Acc. No. 219409-21.

Figure 2.* Normal fundus mucosa of the stomach. At the left the gastric pits are seen to be very short and most of the mucosa to be formed by the gastric glands. At right a detail of the gastric glands shows the preponderance of chief and parietal cells. X 425. A. F. I. P. Acc. No. 219409-22.

Tumors of the Stomach

Fig. 1

Fig. 2
GASTRITIS

Figure 3. Atrophic antral gastric mucosa showing reduction in number of gastric glands, lengthening of gastric pits, transformation of some into intestinal type (intestinal metaplasia) recognizable by deeper staining and accentuation of nuclei, and by the formation of two microcysts. (Reproduced from figure 1 in Stout, A. P. Gastric mucosal atrophy and carcinoma of the stomach. New York State J. Med., 45:973-977, 1945.) A. F. I. P. Acc. No. 219409-23.

Figure 4. Intestinal metaplasia in a gastric pit. The nuclei are larger, more hyperchromatic, and the cytoplasm appears darker because of the frequent presence of acidophile granules characterising Paneth cells. ×425. A. F. I. P. Acc. No. 219409-24.
GASTRITIS

Figure 5. Atrophic gastritis. Section taken longitudinally along the lesser curvature of the stomach at the junction of the antral mucosa (right) with the fundic mucosa (left). The antral mucosa is exceedingly thin with very few glands. The fundic mucosa is somewhat thinned and shows some intestinal metaplasia. There is an excessive infiltrate of lymphocytes with follicle formation and of other mononuclear cells in the antral mucosa and submucosa, extending for a short distance beneath the fundic mucosa. A. F. I. P. Acc. No. 219409-25.

SUPERFICIAL SPREADING CARCINOMA

Figure 6. Superficial spreading carcinoma of the stomach. The patient had a penetrating carcinoma of the antrum with metastases to inferior gastric nodes and multiple widespread foci of mucosal cancer. The photograph is an unsuccessful attempt to show transformation of noncancerous to cancerous glands; but all it shows is an intermingling of noncancerous and cancerous glands, each of which is distinct from the other. × 252. A. F. I. P. Acc. No. 219409-26.
plasm become more deeply chromatic and darker; the character of the mucus secreted stains readily with mucicarmine, whereas gastric mucus does not; and coarse acidophilic granules characteristic of Paneth cells appear. At the same time the underlying gastric glands of the antral zone gradually disappear, until the entire mucosa in patchy areas may be composed of mucus-secreting pits resembling the crypts of Lieberkühn. Microcysts may be found and occasionally even the entire mucosa may become cystic (figs. 3, 4). When these changes occur, the entire mucosa may become thinner; and, conversely, the antral mucosa may become thinner without such intestinal metaplasia. Generally the fundus mucosa fails to show similar changes, although occasionally an extension of the antral type of mucosa into the fundus for short distances may take place. This sparing of the fundus from such atrophic and metaplastic changes explains the fact that extreme atrophy may occur in the antrum and pylorus without necessarily any reduction in the quality and acidity of the gastric juice secreted (fig. 5).

Since the changes above described are found with increasing frequency and with greater severity as aging progresses and most particularly in that part of the stomach where the greatest number of adenomatous polyps and carcinomas are found, many have tried to prove that metaplasia, microcyst formation, and atrophic thinning constitute precancerous changes. While several writers have expressed their conviction that these are precancerous, ultimate proof is lacking. It is not possible to obtain normal and carcinoma cells in juxtaposition even when the latter are multicentric and confined to the mucosa, and the statistical approach fails because the differences are not great enough to be significant (fig. 6).

References


BENIGN TUMORS

Adenomatous polyps (adenoma, polyp, papillary adenoma) are growths composed largely of mucus-secreting glands which develop in the mucosa of various parts of the stomach. As indicated in table I, they are relatively rare in comparison with the frequency with which carcinoma is found. As in carcinoma, males predominate in the proportions of three to two. These adenomatous growths are found almost always in the later years of life, usually associated with hypochlorhydria or achlorhydria; the gastric mucosa is commonly atrophic but occasionally may be hypertrophic. They are multiple in about one third of the patients. The small sessile polyps which have the same color and appearance as the surrounding mucosa prove on microscopic study to be no more than localized hyperplastic proliferations of the mucosa. The larger polyps, which project into the lumen to a greater extent, are darker, may be sessile or pedunculated, and are composed of mucus-secreting glands of a distinctly neoplastic aspect (figs. 8, 9). Many of them are dilated into microcysts which occasionally show papillary infoldings. As with the rectal polyps, it is often difficult to decide whether or not to designate as carcinoma the changes seen in some polyps. One has to depend upon anaplasia of cells to decide this point, if there is no evidence of invasion of the stalk or the underlying substantia propria of the mucosa or of the submucosa. Of 32 adenomatous polyps of the stomach recorded in the Laboratory of Surgical Pathology of Columbia University, 22 were from male patients. The ages varied from 22 years to 75 years. All but two patients were over 45 years of age. The largest polyp was pedunculated and measured 7 x 5.5 x 2.5 cm. Twenty-two were 1 cm. or less in the greatest dimension and 12 of these were 5 mm. or less. The malignant and questionable polyps were all 1.5 cm. or over in the greatest dimension. The polyps were associated in the same stomach with an independent carcinoma in 15 cases (fig. 7). Seven of the eight cases with multiple polyps had an independent carcinoma. Two of the ten larger polyps showed carcinoma in the polyp and in one other there were questionable carcinomatous changes. Rarely, multiple polyps in the stomach are associated with multiple polyposis of the entire gastrointestinal tract.

Gastritis polyposa is not a tumor but a hyperplastic condition leading to the formation of a coarse cobblestone appearance of a portion of the gastric
mucosa; or else there occurs a localized exaggeration of the mucosal folds to
such an extent that with the stomach in situ a protruding tumor-like mass is
formed, which can simulate the appearance of a fungating carcinoma when
the stomach is visualized by roentgen ray (fig. 10). Histologically the lesion is
much less striking. The somewhat edematous mucosa and submucosa is
thrown up into polypoid-appearing folds but the actual thickness of the mucosa
is either normal or slightly increased. The mucous pits are elongated, some-
times branched, and occasionally microcystic (fig. 11). It is uncertain whether
or not this condition is precancerous.

Superficial benign carcinoid tumors in the mucosa and submucosa of the
stomach and first part of the duodenum are so rare as to be curiosities. They
are small, symptomless, and discovered only by chance. The propriety of
calling these small carcinoids benign may be questioned. It can be stated
that the great majority of such small superficial tumors when found have not
metastasized. An occasional one in the intestinal tract, however, has done
so (see Malignant Carcinoid).

Heterotopic tumors (pancreatic adenoma, Brunner’s gland adenoma, my-
oepithelial hamartoma, compound adenoma). It is well known that distur-
ances of development of the gastrointestinal tract may lead to the formation
of glandular elements in the wall of one portion of the tract which normally
are not found there. When these misplaced elements proliferate, they may
form a tumor-like nodule which may cause symptoms if it occurs near the
pylorus or cardia or if ulceration takes place in the overlying mucosa. The
commonest heterotopia in the stomach and first part of the duodenum is an
adenoma composed of differentiated pancreatic glands and ducts. Islets are
seldom reported. These pancreatic adenomas rarely grow very large (figs.
12–14); and whether or not they ever lead to cancer formation is unknown,
although it has been suggested that they may be responsible for some of the
linitis plastica gastric carcinomas which seem to have so slight an associa-
tion with the gastric mucosa.

It is probable that the leiomyoma is the commonest of the benign gastric
neoplasms. Meissner assures us that a painstaking search will reveal leio-
myomas in more than half of all stomachs examined. Rieniets found an in-
cidence of 16 percent gastric leiomyomas in 200 consecutive autopsies; and Dr.
Lauren V. Ackerman informs me that Franz Leidler, working at the St. Louis
City Hospital, found an incidence of 23 percent (226 stomachs) in 1,000 con-
secutive autopsies. The leiomyomas varied from 1 to 25 mm. in diameter,
and in 52 instances they were multiple. So far as this writer knows, no one else
has undertaken to confirm or deny this finding. In any event tumor nodules
sufficiently large to cause symptoms are definitely uncommon. They arise
Tumors of the Stomach

ADENOMATOUS POLYP AND CARCINOMA

Figure 7.* Fungating carcinoma of the stomach with multiple adenomatous polyps.  A. F. I. P. Acc. No. 219409-1.

*The illustrations of stomachs or portions of stomach in all the gross photographs are oriented according to the anatomical position of the stomach in the ordinary roentgen ray film. The pylorus is to the left and the fundus to the right. Most of the stomachs have been opened along the greater curvature and the anterior wall reflected upwards. The anterior wall of the stomach is therefore the upper half and the posterior wall the lower half when the entire stomach is illustrated.
ADENOMATOUS POLYP

Figure 8. Adenomatous polyp measuring 1.2 x 1.5 x 1 cm. in the stomach of a 65-year-old woman. It is composed of proliferated mucous glands with microcyst formation. No evidence of malignancy. A. F. I. P. Acc. No. 219409-27.

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Fig. 8

Fig. 9
GASTRITIS POLYPOSA

Figure 10. Chronic hypertrophic gastritis (gastritis polyposa), involving antrum and pylorus of stomach removed because of duodenal ulcer. A. F. I. P. Acc. No. 219409–12.

Figure 11. Gastritis polyposa, hypertrophic gastritis. Polypoid exaggeration of mucosal folds in the fundus. The normal fundic glands are often reduced or absent and replaced by elongated pits, and there are several microcysts. There is, however, little true glandular proliferation of the mucosa. A. F. I. P. Acc. No. 219409–29.
ADENOMA OF PANCREAS

(Figures 12–14 are from the same case)

Figure 12. Supernumerary pancreas (adenoma) in anterior antral wall. Clinical suspicion of carcinoma. The nodule, which measures 1.5 x 1 cm., lies in the muscularis and submucosa, 1 cm. from the pylorus and 6 mm. from the greater curvature. A. F. I. P. Acc. No. 219409-30.

Figure 13. The heterotopic tissue is composed of pancreatic glands, ducts, and Brunner’s glands. No islets are identified. × 21. A. F. I. P. Acc. No. 219409-31.

Figure 14. Brunner’s glands, pancreatic acini, and a duct lined with cylindrical cells can be found in the section. × 469. A. F. I. P. Acc. No. 219409-32.
Tumors of the Stomach

Fig. 12

Fig. 13

Fig. 14
usually in the muscle coat; only rarely in the muscularis mucosae. They are sharply circumscribed, although never truly encapsulated. The nodule formed may project entirely toward the lumen, entirely toward the serosa, or it may grow in both directions producing an hourglass tumor (figs. 15, 16, 20). The tumors are solid and sometimes quite vascular but are subject to two important changes: The overlying and previously intact gastric mucosa which smoothly covers the bulging tumor may ulcerate, leading to deep excavation of the tumor and, in an appreciable number of cases, to severe and even exsanguinating hemorrhages. The other important change is degeneration and necrosis of the tumor tissue due to hemorrhages and vascular thromboses. The histologic variations are many and often difficult to interpret. It is only seldom that the interlaced bands of smooth muscle cells and fibers with their reticulin sheaths are so much like normal smooth muscle as to be easily recognized in hematoxylin-eosin sections (fig. 17). Often the cells are larger and sometimes vary in relative size; and myofibrils may be recognized, if they are present at all, only after good fixation in Bouin's or Zenker's fluid and the use of differential stains such as Masson's trichrome or Mallory's phosphotungstic acid hematoxylin. When degeneration alters the picture, the cells may become even more bizarre and appear rounded or polygonal, occasionally with monstrous nuclei. It is important to remember also that smooth muscle cells as they proliferate often tend to have their nuclei more or less aligned in a fashion more familiarly seen in the neurilemoma.

All of these changes have led pathologists to call leiomyomas of the gastrointestinal tract various inaccurate names, chief among which are neurilemoma or one of its many synonyms, or sarcoma usually either leiomyosarcoma or fibrosarcoma. If one will only remember that the neurilemoma is always an encapsulated tumor, whereas the gastrointestinal leiomyoma never has an actual capsule, much error and confusion will be avoided (see also Fascicle 5, ‘Tumors of the Soft Tissues,’ and Fascicle 6, ‘Tumors of the Peripheral Nervous System’). The decision as to whether a given gastric smooth muscle tumor is benign or malignant is more difficult. If there are many mitoses present, it is safe to call the tumor malignant. If it displays persisting invasive growth outside the stomach wall with marked hemorrhages into the necrosis of the tumor substance, it will probably prove to be malignant even if mitoses are few. But if neither of these features is present, no matter how bizarre the histologic appearance, the tumor will probably not metastasize and will not recur if completely removed; or if incompletely removed and recurrence takes place, it will show only limited growth and remain localized. Implantation of leiomyomatous cells at the time of excision may lead to the formation of a
LEIOMYOMA

(Figures 15-17 are from the same case)

Figure 15. An hourglass tumor high on the lesser curvature with a large extragastric and smaller intragastric projection. A subtotal gastrectomy came very close to the tumor edge. The patient died 11 years later. Autopsy showed a small nodule in the lesser omentum, interpreted as a persisting implant, but no tumor elsewhere. (Reproduced from figure 14. Golden, T., and Stout, A. P. Smooth muscle tumors of the gastrointestinal tract and retroperitoneal tissues. Surg., Gynec. & Obst., 73: 784-810, 1941.) A. F. I. P. Acc. No. 219409-33.
LEIOMYOMA

(Figures 15-17 are from the same case)

Figure 16. The same tumor as shown in figure 15 with the tumor nodules transected. The dark mosaic pattern is due to hemorrhage and necrosis. It would be impossible grossly to distinguish this leiomyoma from a leiomyosarcoma, which might have exactly the same appearance. A. F. I. P. Acc. No. 219409-34.

Figure 17. The smooth muscle cells forming the tumor are quite well differentiated, with blunt-ended nuclei. Myofibrils are present but cannot be distinguished in the picture. Necrosis and hemorrhage fill in the spaces between the tumor cell bundles. A. F. I. P. Acc. No. 219409-35.
GRANULAR CELL MYOBLASTOMA

(Figures 18 and 19 are from the same case)

Figure 18. Small symptomless nodules found at autopsy in the submucosa of the cardia. A similar but larger nodule was found beneath the squamous mucosa of the adjacent esophagus. × 24. (Courtesy of Dr. Maurice Richter, New York University Hospital, N. Y.) A. F. I. P. Acc. No. 219409-36.

Figure 19. Detail showing cells from the case illustrated in figure 18. × 630. A. F. I. P. Acc. No. 219409-37.
LEIOMYOMA


HEMANGIOPERICYTOMA

(Figures 21–24 are from the same case *)

Figure 21.** A 63-year-old male. Gastroscopy showed a mound at pyloric end of stomach suggestive of neoplasm. Partial gastrectomy. No recurrence after five years. A. F. I. P. Acc. No. 67221-1.

Figure 22. The tumor lies chiefly in the submucosa extending into the mucosa. It is made up of numerous units with vascular lumens at the center surrounded by concentrically layered pericytes. × 21. A. F. I. P. Acc. No. 67221-2.

*It is only fair to remark that Dr. Elson B. Helwig of the Armed Forces Institute of Pathology does not agree this is a hemangiopericytoma but thinks it is an inflammatory fibroid polyp. From the Armed Forces Institute of Pathology.

HEMANGIOPERICYTOMA
(Figures 21–24 are from the same case)

Figure 23. Layering of spindle-shaped pericytes about the vascular lumens. (From the files of the Armed Forces Institute of Pathology.) × 469. A. F. I. P. Acc. No. 67221-3.

Figure 24. Laidlaw reticulin impregnation showing reticulin sheaths of vessels and layered reticulin fibers accompanying spindle-shaped pericytes. (From the files of the Armed Forces Institute of Pathology.) × 469. A. F. I. P. Acc. No. 67221-4.
Tumors of the Stomach

Fig. 23

Fig. 24
GLOMUS TUMOR

Figure 25. Found by chance in the wall of the stomach of a man who had carcinoma. The characteristic epithelioid cells (pericytes) are found in the walls of the numerous vessels characterizing the tumor. × 180. (Figure 1 from Kay, S., Callahan, W. P. Jr., Murray, M. R., Randall, H. T., and Stout, A. P. Glomus tumors of the stomach. Cancer, 4: 726-736, 1951.) A. F. I. P. Acc. No. 219409-41.

LIPOMA

Figure 26. Lipoma of stomach in submucosa. (Courtesy of Dr. Carl L. Gillies, Iowa City, Iowa, and Dr. Lauren V. Ackerman, St. Louis, Mo.) A. F. I. P. Acc. No. 219409-81.
LYMPHANGIOMA

(Figures 27 and 28 are from the same case)

Figure 27. Lymphangioma of stomach in mucosa of posterior wall near greater curvature and pylorus. Chance finding in stomach resected for simple ulcer on lesser curvature. A. F. I. P. Acc. No. 219409-4.

Figure 28. A congeries of dilated lymphatic vessels associated with some lymph follicles. × 34, reduced about one fourth. A. F. I. P. Acc. No. 219409-42.
Tumors of the Stomach

Fig. 27

Fig. 28
NEUROMA OF DUODENUM
(Figures 29 and 30 are from the same case)

Figure 29. Photomicrograph of the bed of a duodenal ulcer at the pylorus. In the scar tissue are many bundles of nerves running in various directions, some of which are markedly thickened. There is no smooth muscle left at this point. × 21. A. F. I. P. Acc. No. 219409-44.

Figure 30. Detail from figure 29, showing one of the thickened nerves with proliferated Schwann cells. × 469. A. F. I. P. Acc. No. 219409-45.
secondary nodule in adjacent tissues. This alone should not be considered a proof of malignancy.

The only example known to the writer of a granular cell myoblastoma form in the stomach is shown in figures 18 and 19 (see Fascicle 5, "Tumors of the Soft Tissues").

Hemangiomas have been found occasionally in cases of widespread multiple hemangiomatosis and in multiple hemorrhagic telangiectasia, but as a solitary lesion it must be extremely rare. Morton and Burger reported two cases and could collect only 12 others prior to 1941.

The unusual hemangiopericytoma has been observed four times by the writer. It is a peculiar tumor (figs. 21–24) which forms a solid nodule in the gastric wall, occasionally with a granulomatous proliferation in the overlying mucosa and submucosa reminiscent of an eosinophilic granulomatous lesion. The microscopic features of this tumor are described in Fascicle 5, "Tumors of the Soft Tissues."

Three examples of glomus tumor occurring in the stomach have been studied by the writer. They formed small nodules in the gastric wall somewhat resembling leiomyomas. Ulceration through the mucosa may lead to hemorrhage. There are no characteristic symptoms or signs that permit a clinical diagnosis. Histologically the tumor has some resemblance to a carcinoid. However, the vascular pattern is quite different and was so distinctive in one case that the diagnosis was made on a quick frozen section at operation. The growth of pericytes from an in vitro explant of this tumor confirmed the diagnosis beyond question (fig. 25, pl. IV–B). (See Fascicle 5, "Tumors of the Soft Tissues.")

Submucous lipomas may form polypoid projections into the gastric lumen simulating leiomyomas or, if they develop outside the muscle coat, the fatty mass can extend outward from the stomach. In the latter case they are symptomless and found only by chance (fig. 26, pl. III–C).

Small symptomless submucosal lymphangiomas rarely form slight thickenings in the gastric wall (figs. 27, 28).

It is surprising that neuromas of the traumatic type are not more often found in the gastric wall, especially in the scarred bed of a peptic ulcer, since the process of ulceration erodes and destroys nerves in the gastrohepatic omentum just as it does blood vessels which happen to be there. Yet it must be a rather unusual event, for the writer has seen only two such neuromas in the stomach and duodenum, both of them in the beds of ulcers (figs. 29, 30).

No error is more frequent than to mistake a leiomyoma of the stomach for a neurilemoma. The literature is overloaded with erroneous reports of this sort. The neurilemoma wherever it occurs is an encapsulated tumor divided into Antoni types A and B tissue and with other definite characteris-
Figure 31. A tiny granulomatous nodule in the gastric mucosa with thinning of the overlying glandular portion. \( \times 122 \). A. F. I. P. Acc. No. 219409-46.

Figure 32. The higher magnification shows the preponderance of eosinophiles in the cellular infiltrate. \( \times 1040 \). A. F. I. P. Acc. No. 219409-47.
tics, including palisading of nuclei. The leiomyoma sometimes has palisading of nuclei, and patchy degeneration may seem to divide it into A and B tissue; but there the resemblance ends.

The only case of neurofibroma of the stomach seen by the writer occurred in a patient with multiple neurofibromatosis. It was a small symptomless nodule found unsuspected in the gastric wall of a patient suffering with von Recklinghausen's disease on whom an exploratory laparotomy had been performed. The histological features will be found in Fascicle 6, "Tumors of the Peripheral Nervous System."

If a fibroma occurs, the writer has never seen an example of it. Minnes and Geschickter found descriptions of 42 among 931 benign gastric tumors. It is probable that most of these were leiomyomas largely replaced by fibrous tissue.

Osteoma, osteochondroma, endothelioma, and dermoid cyst of the stomach are mentioned by Minnes and Geschickter. The writer has never seen an example of any of these.

Large et al. have reported a benign teratoma in a 7-month-old infant, which lay in the posterior wall of the antrum and was successfully removed by subtotal gastrectomy.

Simple macroscopic cysts are mentioned both by Borrmann and by Minnes and Geschickter. They are unknown to the writer.

Inflammatory polyp or granuloma. In most instances when the mucosa ulcerates, no exuberant granulomatous tissue projects outward into the lumen. It is possible for this to occur, however, on rare occasions, and small polypoid projections imitating the appearance of adenomatous polyps may be found.

Eosinophilic granuloma. Vaněk has described six cases of a peculiar small polypoid or sessile granulomatous nodule in the gastric submucosa and mucosa characterized by the presence of large numbers of eosinophilic leucocytes. It is sometimes associated with a peptic ulcer but more commonly is solitary. Its significance is unknown (figs. 31, 32).

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FUNGATING CARCINOMA


PENETRATING CARCINOMA

MALIGNANT TUMORS
CARCINOMA

Epidemiology and Symptomatology

Carcinoma of the stomach used to be considered the most frequent of all cancers in males and one of the more common ones in females. The proportion of three males to two females is still maintained; but it is now third among cancers in males, being surpassed by the skin and by the colon and rectum taken together; and fourth among females, with the breast, uterus, and colon ahead of it. Carcinoma is uncommon before the fifth decade and reaches the peak of frequency in the sixth and seventh decades of life. There are two characteristic clinical modes of onset in gastric cancer: (A) After a lifetime of good health a man or woman suddenly begins to suffer from "indigestion consisting usually of epigastric pain or discomfort or a feeling that food is remaining too long in the stomach" (Alvarez; Harris). This may be accompanied by loss of appetite, weight, and strength (McVicar and Daly; Spriggs). (B) In a second group the patients have suffered for years with gastric disorders which may be due to either gastritis or peptic ulcer. Suddenly the character of the symptoms changes and the patient starts to go downhill (Usland; Allen; Palmer). Vomiting, severe pain, occult or obvious bleeding, flatulence, and a palpable mass are all late signs which often appear only after the cancer is hopelessly advanced.

Situation in the Stomach

Carcinomas may develop anywhere in the stomach from the cardia to the pylorus but the majority grow from the mucus-secreting cells of the antrum and pylorus, more particularly along the lesser curvature. Since peptic ulcers are found chiefly along the lesser curvature of the antrum and pylorus and the adjacent anterior and posterior walls, occasionally along the lesser curvature of the fundus and at the cardia, but hardly ever along the greater curvature half of the stomach, this knowledge can be of assistance in aiding differential diagnosis (fig. 33).

Clinical Diagnosis

In the early stages while the patient is still potentially curable, there are no physical signs, except in a few cases of fungating carcinoma when an
Tumors of the Stomach

LOCATION OF 113 PEPTIC ULCERS IN 81 RESECTED STOMACHS

figures indicate distance from pylorus in centimeters.
broken line in stomach indicates junction of antral and fundic mucosae.

LOCATION OF 120 CARCINOMAS IN 120 RESECTED STOMACHS

Figure 34.∗ Gastric abrasive balloon specimen. Sheet of normal mucosal cells. × 600. A. F. I. P. Acc. No. 219409-50.

Figure 35.∗ Gastric abrasive balloon specimen. Sheet of carcinoma cells. × 600. A. F. I. P. Acc. No. 219409-49.

∗Courtesy of Dr. George N. Papanicolaou.
epigastric mass may be palpable. The majority of writers feel that examination by roentgen rays is the most reliable method of detecting a carcinoma; but even this may fail to detect a very small lesion, or differentiate with assurance between a peptic ulcer and an ulcerated penetrating carcinoma or eroded superficial spreading cancer. By this method derangements of motility, pyloric obstruction, projecting tumors, ulcerated lesions, and changes in the rugae can all be visualized, and their significance interpreted with a high degree of accuracy by an experienced radiologist. The reflected images of these same changes can be seen by the gastroscope, although not as completely, because there are blind spots which cannot be inspected. When care is used in performing the analysis and obtaining the specimens, Holman believes that examination of the gastric contents is of great value in differentiating between peptic ulcer and cancer. He found that 100 percent of patients with peptic ulcers had a normal or elevated secretion of hydrochloric acid and 96 percent of patients with carcinomas of the stomach had a low acidity or anacidity. Lactic acid in the gastric contents strongly suggests the presence of cancer but does not prove it (Davidson and Calder). Determination of the changes of electrical potential in the stomach in various conditions is another possible mode of differential diagnosis still in process of investigation. Examination of gastric washings by the Papanicolaou technique for cancer cells has occasionally permitted a positive diagnosis of carcinoma of the stomach but in disappointingly few cases. However, the introduction of the abrasive balloon technique for obtaining cells from the gastric mucosa promises better results (figs. 34, 35). Finally, there must be mentioned the mass screening by means of the fluoroscope of unselected men and women 50 years old and over without gastrointestinal complaints, as carried out by St. John, Swenson, and Harvey. In this study of 2413 individuals, two unsuspected carcinomas and one lymphosarcoma of the stomach, but no polyps, were detected. In a more recent screening based on gastric analyses of 1253 patients over 50 years of age by Stal et al., 370 were hypochlorhydric or achlorhydric; and of these 10 patients had polyps and two had carcinomas. Such pilot investigations are interesting but cumbersome, time consuming, and costly, and so far cannot be used for the population as a whole. It is to be hoped, however, that the photofluorographic method introduced by Roach, Sloan, and Morgan may prove more feasible in the field of mass screening.

References


Gross Pathology

The gross pathological anatomy of gastric carcinoma is most important and is dependent upon the way in which the different kinds of carcinomas grow. If one will remember that carcinoma starts from one or more focal points and tends to grow in every direction, but that the speed of growth in one direction or another varies in different patients, the gross characteristics of the tumors will be more easily understood.

If the greatest speed of growth is toward the lumen, a cauliflower-like mass projecting into the stomach is formed and aptly designated as a fungating carcinoma (pl. I–A). Fungating carcinomas are sometimes simply superficially eroded, but sometimes ulceration removes the central part of the tumor, leaving only the outside projecting rim. Eventually these carcinomas penetrate through and along the gastric wall but at a less rapid rate than when growing toward the lumen (figs. 36, 37). At the Presbyterian Hospital 22.7 percent of gastric carcinomas were called fungating.
Tumors of the Stomach

FUNGATING CARCINOMA

Figure 36. Fungating carcinoma with ulceration of the cardia, invasion of the esophagus, and metastases to the superior and inferior gastric and retroperitoneal lymph nodes. A. F. I. P. Acc. No. 219409-51.

Figure 37. Fungating ulcerated carcinoma of the stomach with metastasis to one inferior gastric and one retroperitoneal lymph node. No recurrence 11 years after partial gastrectomy. The photograph shows protrusion of the fungating tumor into the duodenal lumen but there was no invasion of the duodenal wall. The nodularity of the duodenal mucosa is due to adenomatous proliferation of Brunner’s glands. A. F. I. P. Acc. No. 219409-52.

PENETRATING CARCINOMA

Figures 38 and 39. These photographs show two stomachs opened along the greater curvature. The pylorus is below and the lesser curvature ascends from it. In each instance an ulcer impinges on the pylorus, a relatively normal mucosa reaches and overhangs the margins, and the rugae have been rearranged so as to point directly toward the center of the ulcer. Figure 38 is a penetrating carcinoma with ulceration and figure 39 a benign peptic ulcer. There is no essential gross difference between the two save that of size. (Reproduced from figure 6, Stout, A. P. Pathology of carcinoma of the stomach. Arch. Surg., 46: 807-822, 1943.) A. F. I. P. Acc. Nos. 219409-79 and 219409-80.

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Tumors of the Stomach

Fig. 37

Duodenum

Fig. 38

Fig. 39
Figure 40. The tumor is composed of completely undifferentiated cells on the lumen surface, partly differentiated cell clusters in an intermediate zone, and relatively well differentiated glands in the deepest parts. The intact muscularis mucosae is shown at the bottom of the picture. There were metastases to nodes along the greater and lesser curvatures. (Same case as Plate II-B.) (Reproduced from figure 2. Stout, A. P. Pathology of carcinoma of the stomach. Arch. Surg., 46: 807–822, 1943.) A. F. I. P. Acc. No. 219409–53.

Figure 41. The picture shows the margin of a shallow ulcer at the left and part of a very thick fibrous submucosa. Partly differentiated cancer glands are present in the base of the ulcer extending outward from it in the mucosa, which still retains part of its normal glands. Groups of cancer cells have penetrated into the superficial part of the submucosa. The arrow indicates a mass of cancer cells in a dilated lymphatic. A. F. I. P. Acc. No. 219409–54.
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LINITIS PLASTICA
(Figures 42 and 43 are from the same case)

Figure 42. The tumor has thickened the submucosa, muscularis, and subserosa by infiltration of great quantities of fibrous tissue in which the cancer cells are present only as inconspicuous isolated small rounded cells and small cell clusters. The muscularis mucosae appears as an intact thin dark line except for one short area in the center of the left half of the picture where tumor passes through it, involving the deepest part of the mucosa. Elsewhere the mucosa is hyperplastic and appears thickened. A. F. I. P. Acc. No. 219409-55.

Figure 43. Detail from figure 42 showing large isolated anaplastic cancer cells in the loose-textured fibrous framework separating the muscle bundles. × 530. A. F. I. P. Acc. No. 219409-56.
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Fig. 42

Fig. 43
In a second variety, **penetrating carcinoma**, growth is primarily away from the lumen, producing ulceration of the tumor from the start. The tumor cells quickly reach the serosa and then spread through and along the gastric wall, but show little tendency to grow upward into the lumen. This is a very important cancer type which is designated by the word penetrating (pl. I–B). It simulates the gross appearance of the chronic benign peptic ulcer. It differs because this cancerous ulcer hardly ever penetrates completely through the muscle coat and is characterized by being shallow and bowl-shaped, whereas the benign peptic ulcer is deep, always completely through the muscle layers, and has steep precipitous walls. Whereas in the benign ulcer the mucosa overhangs the ulcer margin and is relatively normal in appearance, the cancerous ulcer usually has a reddened and nodular-appearing mucosa which does not overhang the edges. This is due to the fact that carcinoma infiltrates or replaces the mucosa surrounding the crater. In the benign ulcer the mucosal folds (rugae) tend to point toward the ulcer crater and often reach its margin, drawn toward it by contraction of the thick scar tissue which forms in the submucosa and gastric wall about the ulcer and in its bed; but cancerous infiltration around the malignant ulceration of a penetrating carcinoma stiffens the tissues so that the mucosal folds tend to stop at a distance from the ulcer margin. Unfortunately not one of the above described differentiating features is entirely reliable—a benign ulcer may assume the appearance of a penetrating carcinoma, while the penetrating carcinoma may have all of the seemingly bland characters of benign ulcer (figs. 38, 39). Of the Presbyterian Hospital stomach carcinomas 27.4 percent were classified as penetrating.

In a third and less common group, **spreading carcinoma**, the cancer grows chiefly along the gastric wall at a more vigorous rate than toward the lumen or the serosa. This group can be subdivided into those confined to the mucosa and submucosa: superficial spreading carcinoma (Stout), slowly progressing erosive gastric cancer (Gutmann and Bertrand), carcinoma in situ (Mallory, Ewing), and into the more deeply seated variety called variously: linitis plastica, fibrous carcinoma, leather bottle stomach, etc.

**Superficial spreading carcinoma** (figs. 40, 41, pl. II–B) in the writer's opinion is a more accurately descriptive term than carcinoma in situ because it can include the tumors which involve both the mucosa and the submucosa without invading the true muscle coat; whereas carcinoma in situ must be limited to the extremely rare cancers found only in the mucosa. The name used by Gutmann and Bertrand implies slow growth which is impossible to prove, and does not emphasize the superficial character of the tumor, one of its most distinctive traits. This tumor while generally smaller can cover an area of 45 square cm. without penetrating beneath the submucosa and
without doing more than thicken the mucosa and submucosa. Of carcinomas so labelled at the Presbyterian Hospital, 8.4 percent were superficial spreading carcinomas. This is the tumor which most often is found associated with peptic ulcer (pl. III-A). Sometimes the ulcer is of short duration. In such cases the carcinoma may have come first and the process of ulceration could have destroyed the central part of the tumor and the full thickness of the gastric wall as well, leaving only the tumor in the mucosa and submucosa about the rim. But it is only pertinent to point out that such deep ulcers of the benign type almost never penetrate completely through the entire thickness of the gastric wall in any other variety of carcinoma. Moreover, when the ulcer has been present for years, it is hard to believe the carcinoma preceded it. The question cannot be regarded as settled. Although this variety of carcinoma is found almost exclusively in the antrum and pylorus and remains superficial for a long time, like all gastric cancers it can metastasize even when entirely limited to the mucosa. Over 50 percent of the Presbyterian Hospital cases had already metastasized to the regional lymph nodes when gastrectomy was done. The cure rate, therefore, while above the average, is disappointingly low.

Linitis plastica, or fibrous carcinoma, (pl. II-A) is altogether different from superficial spreading cancer. Starting either from the glands in the deepest layer of the mucosa or from heterotopic glands in the muscularis or submucosa, it permeates and thickens the gastric wall, accompanied everywhere in its growth by an excessive production of fibrous scarlike tissue (figs. 42, 43). This spread has often reached both cardia and pylorus by the time exploration is made, and the whole stomach has a uniformly thick, leathery wall markedly contracted because of the large amount of scar tissue. The mucosal lining is generally edematous and reddened and has thick folds, but it may be impossible to appreciate the presence of carcinoma in it on inspection. The carcinoma cells in some areas are present only as isolated inconspicuous units, so that both in paraffin sections and especially in frozen sections they may be exceedingly difficult to recognize. In the past it is possible that failure to recognize the presence of carcinoma cells has led to the belief that leather bottle stomachs are not always due to carcinoma. If a non-neoplastic variety exists, this writer personally has never encountered an example, although Ackerman has told him of two fibrous syphilitic stomachs with characteristics of linitis plastica carcinoma. Of the Presbyterian Hospital cases 4.5 percent were called linitis plastica.

While the majority of gastric carcinomas at the time of operation can easily be classified in one or another of these three types (i.e. fungating, penetrating, and spreading), there remain a number of late and extensive tumors which defy classification either because their earlier distinctive fea-
Tumors of the Stomach

PLATE II

LINITIS PLASTICA

A. Linitis plastica or deep spreading carcinoma of stomach extending in the deeper layers from pylorus to cardia, but with minimal mucosal involvement. A. F. I. P. Acc. No. 219409-7.

SUPERFICIAL SPREADING CARCINOMA

B. Superficial spreading carcinoma of antrum and pylorus, with superficial erosion but with no penetration beneath the submucosa. (Same case as figure 40.) A. F. I. P. Acc. No. 219409-8.
Tumors of the Stomach

PLATE II
Tumors of the Stomach

Tumors have been lost or because they have features which so far have not been recognized as distinctive (pl. III—B). Almost all of them are far advanced and probably incurable. The writer places these in a group together designated as carcinomas of no special type. Thirty-seven percent of our cases were so classified (table II).

Table II
CARCINOMA OF STOMACH
Laboratory of Surgical Pathology, Columbia University

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fungating</td>
<td>107</td>
<td>22.7</td>
</tr>
<tr>
<td>Penetrating</td>
<td>130</td>
<td>27.5</td>
</tr>
<tr>
<td>Spreading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial spreading</td>
<td>39*</td>
<td>8.3</td>
</tr>
<tr>
<td>Linitis plastica</td>
<td>21</td>
<td>4.5</td>
</tr>
<tr>
<td>No special type</td>
<td>173</td>
<td>37.0</td>
</tr>
<tr>
<td>Total</td>
<td>470</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*34 (7.2%) were associated with peptic ulcer.

There are other methods of classifying gastric carcinomas, the best known of which is that of Borrmann. He recognizes four gross types which he describes as follows: Group I. Circumscribed, solitary, polypoid carcinomas without important ulceration; Group II. Ulcerated carcinoma with wall-like marginal elevation and sharply defined borders; Group III. Ulcerated carcinoma in part with marginal elevation and in part with diffuse spread; Group IV. Diffuse carcinoma. These four varieties are arranged in an ascending order of malignancy, i. e. Group I is the least malignant and Group IV the most malignant.

Microscopic Pathology
Since probably almost all of the gastric carcinomas are derived from the mucus-secreting cells of the gastric pits or gastric glands, it is not surprising to find that almost all of them show some degree of differentiation by forming more or less atypical tubes and by secreting mucus. The most distinctive feature characterizing the majority is their extreme degree of variability of differentiation. A very small number are almost exclusively glandular, and another tiny group may consist entirely of undifferentiated cells; but the vast majority show both of these features in different parts of the same tumor. It is this fact which makes the histological classification so hopeless and unrewarding. If a tumor is largely glandular, it can be called adenocarcinoma; but where is one to draw the line and stop calling a tumor...
PLATE III

SUPERFICIAL SPREADING CARCINOMA
AND PEPTIC ULCER


CARCINOMA OF NO SPECIAL TYPE

B. Carcinoma of the stomach which developed at the stoma of a gastrojejunostomy done 33 years before. A. F. I. P. Acc. No. 219409-10.

LIPOMA

C. Lipoma of stomach in submucosa. A. F. I. P. Acc. No. 219409-1C.
by this name? Some tumors form a great deal of mucus either outside of the cells so that they swim in it, or it remains inside the cells and causes them to assume the shape of a signet ring. One can use the names colloid or mucoid (i.e., mucinous) or gelatinous carcinomas for such tumors; but again what are the criteria which will govern the degree to which these features must be present before these names should be used? So far as I know they do not exist (figs. 44–47). Very rarely a carcinoma will show some degree of squamous metaplasia, and the name adenoacanthoma has been applied to these. The writer cannot see any virtue in these names in stomach carcinomas. He contents himself with the gross classifying term and a description of the degree to which differentiation is present, without attempting to refer to adenocarcinoma, colloid carcinoma, adenoacanthoma, or any of the names based on histopathology.

Multiple Carcinomas

In addition to the superficial spreading carcinoma in the mucosa, one occasionally encounters more than one carcinoma of other types in the same stomach. This can occur both with and without multiple polyps. We have also seen a patient, apparently cured by partial gastrectomy of a fungating carcinoma of the stomach, develop an apparently new infiltrating carcinoma in the remaining gastric pouch 23 years later.

Local Spread

It is very important for surgeons to know how carcinoma spreads outside of the stomach, so that attempts at cure by gastrectomy can be properly planned. When carcinoma reaches the outer confines of the gastric wall at the omental attachments, it continues to grow directly into them. It may thus extend through the gastrohepatic omentum directly into the liver, or through the gastrocolic omentum into the transverse colon and great omentum. When it reaches the serosa outside of these attachments, its cells may become detached and reach other peritoneal sites of implantation through the peritoneal cavity; but more commonly adhesions form and the tumor cells grow into these adhesions. In this way they may pass directly to the pancreas, diaphragm, spleen, abdominal wall, or retroperitoneum. At the pylorus, which is often impinged upon by carcinoma, a fungating tumor may protrude a polypoid mass through it (fig. 37), but will not penetrate into the superficial part of the duodenal mucosa more than 1 or 2 mm. It is not inhibited by the deeper layer of the mucosa or the other coats of the duodenal wall and eventually may involve all of the first portion and enter the second. But carcinomas at the pylorus do not seem to spread anywhere in the duodenal wall with the same ease and rapidity they display in traversing the gastric coats. At the cardia, gastric cancer does not hesitate to invade the
CARCINOMA

(Figures 44–47 are from the same case)

Figure 44. This figure together with figures 45, 46, and 47 illustrates the variations which can occur in the same carcinoma. Here are shown side by side partly differentiated glands and much smaller rounded cells with no evidence of gland formation. Some show cytoplasmic vacuoles containing mucus. × 490. A. F. I. P. Acc. No. 219409–57.

Figure 45. Relatively well differentiated glandular formations. × 490. A. F. I. P. Acc. No. 219409–58.
Tumors of the Stomach

Fig. 44

Fig. 45
CARCINOMA
(Figures 44–47 are from the same case)

Figure 46. Carcinoma of stomach, showing an area of mucus in which a group of degenerate cancer cells appear to be floating. This is the picture of so-called colloid, mucoid, or gelatinous carcinoma. × 490. A. F. I. P. Acc. No. 219409–59.

Figure 47. Undifferentiated carcinoma cells growing in a dilated lymphatic vessel in the mucosa at a distance from the main tumor. Metastases were found in the regional lymph nodes. × 490. A. F. I. P. Acc. No. 219409–60.
Tumors of the Stomach

Fig. 46

Fig. 47

F21-71
esophagus any more than esophageal primary epitheliomas hesitate to invade the stomach (fig. 36, pl. IV-A). It should be remarked that with the exception of limitis plastica, which invades both duodenum and esophagus, a carcinoma that has arisen in the distal third of the stomach is rarely found extending into or even close to the esophagus in a patient coming for treatment; and conversely, a carcinoma starting at the cardia or high up in the stomach seldom has reached the pylorus when gastrectomy is performed.

**Metastasis**

In a paper published in 1943 dealing with the pathology of gastric carcinoma, the writer had the assistance of Dr. Robert C. Horn, Jr.,* in analyzing the metastatic spread of gastric carcinoma. The study comprised 225 resected gastric carcinomas, 143 autopsies on cases not subjected to gastrectomy, and 42 autopsies on patients whose stomachs had previously been resected. The lymph nodes along the greater and lesser curvatures were by far the most common tissues to receive metastases. These were involved in 88 percent of autopsy cases and 70 percent of the resected stomachs. In the autopsy cases, metastases were found in the liver in 49 percent, the peritoneum, omentum and mesentry in 42.6 percent, and the lungs and pleurae in 32.8 percent. Many other sites were involved but in much lower percentages. Among these may be mentioned ovary (14 percent), bones (11.2 percent), supraclavicular and cervical nodes (8.4 percent), the pharynx in four cases (2.1 percent), the thyroid in three (1.6 percent), the umbilicus and subcutaneous tissues one each (0.5 percent), and the meninges in one of 26 brains studied. It is of particular interest to note that of 143 cases autopsied without previous gastrectomy, 15, or 10.5 percent, of the tumors were described as having neither metastasized nor extended outside the stomach wall. Eleven others were limited to the immediate vicinity of the stomach; 10 of these had metastases only in the perigastric nodes and one had no metastases but had invaded the duodenum. Thus 26 patients or 18 percent died while their cancers were in a theoretically operable state. The 42 autopsies on previously gastrectomized patients included 32 who died postoperatively and eight who died after a lapse of six or more months. In only four of the 32 who died postoperatively did the autopsy reveal persisting tumor; three had distant metastases, and one had local persistence. Of the other eight patients dying later, three had distant metastases, three had local recurrences but no distant metastases, and one an apparently new gastric carcinoma after a lapse of 23 years. Only one had no tumor four years after operation. It is well to point out, however, that in the ordinary autopsy no attempt is made to study all gastric

*Now associate professor of pathology at the University of Pennsylvania School of Medicine and surgical pathologist of the University Hospital.
lymph nodes and the operative wounds with the same meticulous care as when stomachs have been resected for carcinoma; therefore 18 percent is probably too high a figure to express the proportion of patients who die with possibly curable carcinomas.

It seems impossible to leave the subject of the metastases from carcinoma of the stomach without mention of one variant which lodges and grows in the ovary, to which the name Krukenberg tumor is still most unfortunately often applied. The Krukenberg tumor of the ovary is always a metastatic carcinoma composed wholly or in part of signet ring cells containing droplets of mucin. Usually but by no means always the primary carcinoma is in the stomach where it is either a linitis plastica or penetrating tumor. No useful purpose is accomplished by labelling this variety of ovarian metastatic carcinoma by the name of Krukenberg tumor: first, because it is a metastatic and not a primary tumor; second, because other histologic variants of stomach carcinoma for which the name Krukenberg tumor is not used can lodge and grow in the ovary; and third, because the primary site from which the tumor springs may be in organs other than the stomach.

**Effects of Carcinomatous Proliferation Upon the Stomach**

In the early stages there may be none or the effects may be insufficient to attract attention. One important effect is the lowering or suppression of gastric secretion, especially of hydrochloric acid; so that there is usually hypochlorhydria by the time the cancer is discovered, and there may be achylia. Almost all carcinomas become at least eroded on the surface, with leakage of blood; and evidence of this can be found in the gastric contents or in the stools. When the tumor grows near the pylorus, it can obstruct it either mechanically or by producing spasm; and it is not uncommon to find hypertrophy of the muscle in the antrum and pylorus. This may cause the thickened pylorus to protrude into the duodenum (fig. 48). One might suppose that ulceration or surface erosion would lead to a desquamation of cancer cells so that they could be detected by the Papanicolaou technique without too much difficulty. As a matter of fact they do not desquamate with the same ease as do, for instance, cells from the cervical canal. Even if one rubs the surface of a carcinoma of the stomach with a gelatin sponge, one does not always find carcinoma cells caught within its meshes. This method, therefore, has not proved as helpful in diagnosis as one might hope.

A very important feature of cancer growth in the stomach is its effect upon gastric motility. Even when only a superficial spreading carcinoma of relatively small size is present, the normal progress of the peristaltic waves may be sufficiently disturbed to be detected fluoroscopically. It is remarkable that carcinoma in the stomach characterized by shallow ulceration pro-
Tumors of the Stomach

PLATE IV

CARCINOMA


GLOMUS TUMOR

Figure 48. Carcinoma of the stomach impinging on the pylorus. The pyloric muscle is hypertrophied and invaded by tumor. This has caused the pylorus to bulge into the duodenal lumen at the right. "D" indicates where the duodenal mucosa begins. It is characterized by the layer of Brunner's glands. A. F. I. P. Acc. No. 219409-61.
roduces a more profound and striking disturbance of gastric motility than is the case with a deep penetrating benign ulcer with extensive surrounding fibrosis of the gastric wall extending over a radius of 2 cm. or more. The writer does not know any convincing explanation of this peculiar fact. An exact knowledge of the various gross morphological appearances assumed by carcinoma in the stomach is of great aid to radiological interpretation.

Lesions of the Stomach Simulating Carcinoma

The most important of these is peptic ulcer. The morphological differences have been described in the paragraph devoted to penetrating carcinoma; but it is important to emphasize once more the fact that there is no certain and entirely trustworthy method of distinguishing between benign and malignant ulceration except by microscopic sections. In cases where the diagnosis remains in doubt even after gastrotomy and direct inspection of the ulcer at operation, the surgeon may wish to resort to biopsy and frozen section. A single fragment taken from one place in the crater's edge may not dispel the doubt. R. Lattes has suggested taking snips from multiple places about the rim, fixing them rapidly in hot Bouin's fluid, freezing, cutting and staining them all together. This method will give more reliable information, and if positive, will permit the surgeon to proceed with a more radical gastrectomy; or if negative, with the less radical ulcer type of gastrectomy.

Next to benign ulcer, lymphosarcoma and its relative, Hodgkin's disease, are perhaps most frequently confused with carcinoma. The morphological differences are dealt with in the section devoted to lymphosarcoma. Here it seems important to emphasize only that lymphosarcoma can imitate all of the different gross carcinoma types; and there are no sure ways of distinguishing them short of microscopic examination. If there are known generalized lesions of lymphosarcoma the diagnosis of the stomach tumor may be assumed to be the same but will not be conclusive since it has been shown that carcinoma and lymphosarcoma may coexist in the same stomach (Rabinovitch, Pines, and Grayzel). Since gastrectomy is the preferred treatment of lymphosarcoma and Hodgkin's disease primary in the stomach, the failure to diagnose them before celiotomy is not important.

Both leiomyoma and leiomyosarcoma may produce a roentgenological picture somewhat suggesting carcinoma; but both of them can usually be identified because of the smooth rounded swelling projecting into the lumen, covered with mucosa entirely or interrupted at one or more points by a deep excavation in the substance of the tumor. Generally the mouth of the excavation where it passes through the mucosa is of less diameter than in the depths. With barium in the stomach, these features can generally be correctly interpreted by the roentgenologist.
Syphilis of the stomach is now a very rare lesion. It can simulate carcinoma because the stomach wall may be irregularly thickened with scar tissue. Ulcers of varying size generally are present and there may be more than one of them in the same stomach. One cannot afford to wait to see if specific treatment will cure, because if the diagnosis is in error, the carcinoma will probably become inoperable. Tumors of neighboring organs or tissues sometimes press upon or even superficially invade the gastric wall and indent it. The roentgenogram may reveal a filling defect, which rarely can be mistaken for carcinoma.

References

Ackerman, L. V. Personal communication.


Lattes, R. Personal Communication.


LYMPHOID AND RETICULOENDOTHELIAL TUMORS

Since lymphosarcoma, Hodgkin’s disease, and plasmacytoma are all derived from lymphoid and reticuloendothelial elements, they should be considered together. No case of leukemia with primary manifestation in the stomach is known to this writer; consequently it has not been listed. The frequency of these tumors can be estimated when it is noted that among 541 primary malignant tumors of the stomach operated upon at the Presbyterian Hospital, New York, 86.9 percent were carcinomas and only 41 or 7.6 percent were lymphomas. There is no special sex preponderance, and the mean age is only a little lower than for carcinoma, due to the fact that lymphosarcoma occurs occasionally in children and young adults.

Lymphosarcoma

PATHOLOGY. Almost all of these tumors take origin in the lymphoid tissue found in the deepest part of the mucosa and in the submucosa. Most of them are reticulum cell lymphosarcomas with only a rare lymphocytic or giant follicle tumor. The tumor cells grow in great solid masses covered by intact mucosa until erosion or ulceration removes it. In one variety multiple confluent nodules make a projection into the lumen like a fungating carcinoma, but usually with a smoother surface (figs. 49–51, pl. V-A, B, VI-A). By the time gastrectomy has been carried out, masses of tumor cells have forced their way through the muscle coats and may form nodular projections beneath the serosa. In a variant of this, the projections into the lumen are not so great; but ulceration excavates them, leaving an elevated rolled margin with masses of tumor cells beneath a still intact mucosa. The only way in which this variety of lymphosarcoma differs from ulcerated fungating carcinoma is that the carcinoma is likely to form a single ulcer and the lymphosarcoma multiple ulcers. In a less common variety the lymphoblasts penetrate directly through the gastric wall, producing an ulcer from the start. Such cases occasionally result in acute perforation and peritonitis. Finally occasional tumors spread widely in the submucosa, producing giant rugae. The spread may be quite extensive before infiltrative growth begins. The hist-
Figure 49. The stomach has been bisected longitudinally with the pylorus at the left. Both halves are shown; the posterior one is above. The massive tumor completely surrounds the stomach and has penetrated through the entire thickness of the gastric wall and invaded the hepato-gastric ligament along the lesser curvature shown at the top. The arrow points to the line of resection on the lesser curvature where tumor tissue was cut through. The patient received no further treatment and died 18 years and 11½ months later without evidence of recurrence or metastasis. (Figure from Taylor, E. S. Primary lymphosarcoma of the stomach. Ann. Surg., 110: 200-221, 1939.) A. F. I. P. Acc. No. 219409-62.
LYMPHOSARCOMA

(Figures 49-51 are from the same case*)

Figure 50. Extension of a solid mass of tumor cells in the submucosa. A. F. I. P. Acc. No. 219409-63.

Figure 51. Detail of tumor cells from figure 50. A. F. I. P. Acc. No. 219409-64.

*Courtesy of Dr. Earl S. Taylor, Princeton, N. J.
Tumors of the Stomach

HODGKIN'S DISEASE

(Figures 52 and 53 are from the same case)

Figure 52. Female, 67 years old. Hodgkin's disease with lesions in the orbit and neck nodes. Two ulcerated lesions in the antrum developed under nitrogen mustard therapy leading to gastric resection. This photomicrograph shows the elevated margin of one ulcer, with the granulomatous Hodgkin's tissue thickening mucosa and submucosa but not extending into muscularis. \( \times 24 \). A. F. I. P. Acc. No. 219409–65.

Figure 53. Hodgkin's disease of stomach and cervical node from the case illustrated in figure 52. At the right is a detail from the neck node showing characteristic Hodgkin's granuloma. At the left detail from the stomach, showing the picture of Hodgkin's sarcoma, with a degenerate Reed cell and many neoplastic reticulum cells. \( \times 560 \). A. F. I. P. Acc. No. 219409–66.
Tumors of the Stomach

PLATE V

LYMPHOSARCOMA

(Plate V-A and B are from the same case)


Tumors of the Stomach
Hodgkin's Disease

The diagnosis of Hodgkin's disease should never be made unless definite Sternberg-Reed multinucleate cells are present in a lesion. If this criterion is strictly adhered to, the number of cases in which the dominant lesion is in the stomach will prove to be very small indeed. Only four such cases have been examined by the writer; and in each one of them, the tumor was a mass enlarging in the submucosa, projecting into the stomach with secondary ulceration, and producing symptoms for which the stomach was resected. It was impossible to differentiate them grossly from lymphosarcoma (figs. 52, 53, pl. VI-B).

Plasmocytoma

SYNONYMS AND RELATED TERMS: Plasmocytoma; plasma cell tumor.

Ende et al. have recorded a case of this rare tumor form. They could find reports of only three other cases in the literature. All of them were solitary tumors unrelated to multiple myelomas and without evidence of distant metastases. In each case there was localized invasion outside of the stomach, metastases in the regional nodes and, in one instance, involvement
PLATE VI

LYMPHOSARCOMA


HODGKIN'S DISEASE

of the mediastinal nodes. Two patients were males and two females, their ages ranging from 32 to 48 years. All four tumors were in the prepyloric zone. It would seem impossible, clinically or grossly, to distinguish such tumors from lymphosarcoma and Hodgkin’s disease of the stomach. Microscopically, one can feel confident that these are true neoplasms and not granulomas if the plasma cells are collected into extensive solid masses instead of being loosely diffused throughout a vascular granulomatous framework. This statement applies even if the plasma cells are relatively normal in appearance. However, the writer has not observed Russell bodies in neoplastic plasma cells.

References


OTHER MALIGNANT TUMORS

Sarcoma

The description of gastric leiomyoma will serve also very well for leiomyosarcoma, since in the majority of instances the two are grossly indistinguishable, and microscopically it is only the relatively greater number of mitoses which permits the diagnosis of malignancy. Almost all of the benign leiomyomas are confined to the stomach and there are no adhesions to surrounding structures. Some of the leiomyosarcomas become adherent to surrounding structures, and may extend far afield to form huge tumors. These do not infiltrate as do carcinomas, but push their way more by expansion and pressure necrosis. These tumors almost invariably have large areas of tumor necrosis and multiple hemorrhages (figs. 54–56).

All other sarcomas are so rare as to be curiosities. Several fibrosarcomas have been recorded. These cases appear to have exactly the same
Tumors of the Stomach

Fig. 54

Fig. 55
Fig. 56

LEIOMYOSARCOMA

(Figures 55 and 56 are from the same case)

Figure 54. The large projecting tumor lies in the posterior wall of the pars media of the stomach near the greater curvature. There is a large crater-like excavation in it. The patient died 11 months after sleeve resection, with a recurrence in the scar and evidence of metastases in the lung. (Figure 2 from Golden, T., and Stout, A. P. Smooth muscle tumors of the gastrointestinal tract and retroperitoneal tissues. Surg., Gynec. & Obst., 73: 784-810, 1941.) A. F. I. P. Acc. No. 219409-67.

Figure 55. The tumor cells grow in vaguely defined cords. Their nuclei are elongated, have blunted ends, and show some tendency to be aligned in palisade formation. The tumor is relatively well differentiated. ×129. A. F. I. P. Acc. No. 219409-68.

Figure 56. Detail of figure 55. Some of the cells show intracellular myofibrils, although this is not easy to detect because the cytoplasm is swollen, vacuolated, and the cell outlines are difficult to identify. The high mitotic rate is the decisive factor indicating malignancy. ×644. A. F. I. P. Acc. No. 219409-69.
MALIGNANT CARCINOID

Figure 57. Basigranular cells in the crypts of Lieberkühn of the appendix. The granules lie in the basal pole of the cell cytoplasm and have been blackened by ammoniacal silver by the Masson-Fontana technique. These are the cells from which carcinoid tumors grow. They are found in the gastric mucosa, usually in gastric pits that have undergone intestinal metaplasia. A. F. I. P. Acc. No. 219409-71.

Figure 58. Carcinoid of stomach in greater curvature. A. F. I. P. Acc. No. 219409-11
Tumors of the Stomach

Fig. 57

Greater Curvature

Pylorus

Fig. 58
MALIGNANT CARCINOID
(Figures 59-61 are from the same case)

Figure 59. Carcinoid tumor involving the pylorus of a negro female 28 years old. She had a partial gastrectomy for duodenal ulcer at the age of 22, and repeated trouble following this from marginal ulcers and persisting symptoms. At exploration, shortly before the present operation, two metastatic retroperitoneal lymph nodes were found. The pylorus was then resected; it contained the tumor illustrated and a third metastatic lymph node. She was well and without evidence of tumor seven years after removal of the primary tumor. × 8.26. A. F. I. P. Acc. No. 219409-70.
Tumors of the Stomach

Fig. 59
Tumors of the Stomach

MALIGNANT CARCINOID
(Figures 59-61 are from the same case)

Figure 60. Detail of the tumor illustrated in figure 59 showing anastomosing cords of tumor cells. They have "shrunk away" in characteristic fashion from the supporting fibrovascular framework. ×469. A. F. I. P. Acc. No. 219409-72.

Figure 61. Silver impregnation has blackened the granules in the tumor cells. As in normal basi-granular cells, the granules are present only in the cytoplasm of one half of the cell, filling one pole and partly surrounding the nucleus. Only about half of the cells contain granules. ×600. A. F. I. P. Acc. No. 219409-73.
Tumors of the Stomach

Fig. 60

Fig. 61
Tumors of the Stomach

COLLISION TUMOR. RHABDOMYOSARCOMA

(Figures 62 and 63 are from the same case)

Figure 62. Collision tumor. A rhabdomyosarcoma (at the left) adjoins a differentiated carcinoma (at the right). Although a few islands of carcinomatous glands are surrounded by the sarcoma, their cells are nowhere in actual continuity, and for the most part the two tumors are distinct one from the other. × 250. A. F. I. P. Acc. No. 219409-74.

Figure 63. This is a detail from the sarcomatous part of the tumor shown in figure 62. Although no cross striations were detected, the long plump strap-shaped syncytia are characteristic of rhabdomyoblasts. × 560. A. F. I. P. Acc. No. 219409-75.
gross characteristics as leiomyosarcomas; and the writer wonders if the reporters may not have miscalled smooth muscle tumors by this name, just as he did many years ago when he lacked experience. The only case of liposarcoma of the stomach, a report of which the writer has read, did not sound like any liposarcoma which he has recognized, and he looks upon it with some suspicion. He has neither seen nor read of any primary malignant vascular tumors in the stomach. The solitary example of Kaposi's sarcoma recorded in table I was a case of multiple visceral involvement seen at autopsy. Two examples of rhabdomyosarcoma have come to the writer's attention; one of these is illustrated in figures 62 and 63.

References


Malignant Carcinoid

There are very variable numbers of basigranular cells in the gastric pits of different individuals, but they can be demonstrated. It is not surprising, therefore, that carcinoid tumors should develop from these cells; what is astonishing is that carcinoid tumors are so rare in the stomach in comparison with the ileum (fig. 57). When such a tumor does grow it forms a bulging, rounded mass in the submucosa and deeper layers of the mucosa, covered with intact mucosa until erosion occurs. Eventually it infiltrates the muscle coats and metastasizes (figs. 58, 59).

Although they progress slowly, they are nevertheless very malignant tumors and sooner or later generally kill. The explanation of this seems to lie in the fact that lymph node metastasis is early. Indeed, as in one of the Presbyterian Hospital cases, this may be responsible for the first symptoms.

Histologically, these tumors have the same features which characterize carcinoids elsewhere. The cells are rounded or cylindrical, usually with moderately acidophilic granules in the cytoplasm. If the characteristic granules are not in the pre-enterochromie phase and the tumor has been freshly fixed in formalin or Bouin's fluid (but not in Zenker's fluid), the Masson-Fontana stain in which the sections have been kept in the ammoniacal silver for 96 hours may blacken them. If the granules are blackened, it is confirmation of the diagnosis; but a failure to blacken should not be regarded as
negating the diagnosis (figs. 60, 61). The cells often in addition contain droplets of lipoid, so that a gross cut surface of the tumor may have a yellowish tinge. The tumor cells occasionally form rosettes, but they do not form tubes. Horn has demonstrated that occasionally carcinoid cells in the intestinal tract may contain droplets of mucicarminophilic material, and the writer can confirm this observation; but he did not see this material in any of these gastric tumors.

References


Carcinosarcoma and Collision Tumor

It is generally agreed that the term carcinosarcoma should be reserved for tumors composed of a conglomeration of sarcomatous and carcinomatous elements inextricably intermingled within the same tumor mass. The term should not be applied to cases in which a carcinoma and a sarcoma coexist in the same organ but in different parts of it, nor should it be used for cases in which the two tumor types collide so that they are in continuity but not commingled. Of course cases in which some of the cells of a carcinoma assume a spindle shape, or otherwise resemble sarcoma, are carcinomas and not carcinosarcomas. Writing in 1926, Borrmann was able to find records of only four acceptable cases. At the Laboratory of Surgical Pathology of Columbia University no cases of carcinosarcoma of the stomach have been recorded. However, there are two cases of collision tumor in which a glandular carcinoma involving the mucosa and submucosa lies in contact with a rhabdomyosarcoma, and at the point of contact the two have intermingled microscopically; but aside from this each one is an independent tumor (figs. 62, 63). This is a very different state of affairs from the carcinosarcoma of the esophagus illustrated in Fascicle 20, "Tumors of the Esophagus," in which carcinomatous and sarcomatous elements were intermingled throughout the entire tumor.

References

Tumors of the Stomach

Fig. 64

Fig. 65
Tumors of the Stomach

Fig. 66

METASTATIC TUMOR
(Figures 64-66 are from the same case*)

Figure 64.* Chorionepithelioma and carcinoma involving the same stomach. A 76-year-old woman whose uterus and ovaries had been removed 13 years before for "adenomyosis of the uterus." The photograph shows the fungating carcinoma on the mucosal surface and the chorionepithelioma on the external surface. A. F. I. P. Acc. No. 219409-76.

Figure 65.* At the left is the differentiated glandular carcinoma; at the right is the chorionepithelioma; and between is the muscular coat of the stomach. A. F. I. P. Acc. No. 219409-77.

Figure 66.* Detail from the chorionepithelioma showing trophoblastic syncytia. A. F. I. P. Acc. No. 219409-78.

*Courtesy of Dr. W. P. Callahan, Jr., St. Francis Hospital, Wichita, Kansas.
Involvement of the Stomach by Metastasis and Direct Invasion

Metastases lodging in the stomach from distant primary malignant tumors are not a very common event. In a series of 500 autopsies on consecutive cancer cases, Willis found the stomach involved only twice—once from an epidermoid carcinoma of the head and neck region and once from the thyroid. Elsewhere in his book he records metastases of hepatoma, multiple myeloma, and chorionepithelioma lodging in the stomach. Involvement of the stomach at autopsy by multiple nodules of Kaposi's sarcoma is recorded at the Armed Forces Institute of Pathology, and similar sporadic cases have been recorded derived from neoplasms primary in many other sites. It is extremely rare, however, for a metastatic lesion to manifest itself during life and appear in a surgically removed specimen. Such a case has been brought to my attention by Dr. W. P. Callahan, Jr.1 What must be assumed to be a metastatic chorionepithelioma in a 76-year-old woman was attached to the outer coats of the stomach with only limited invasion of the external muscular layer. There was an independent glandular fungating carcinoma springing from the mucosa of the same region. Since the woman's urine gave a positive Friedman test immediately after gastrectomy, due to other metastatic tumors in the lungs and central nervous system, the diagnosis seems well established. Borrman records the comparable case of Davidsohn, with chorionepithelioma on the outside and an independent carcinoma on the inside of the stomach (figs. 64–66).

The stomach can be directly invaded from without by carcinomas arising in the transverse colon with production of a gastrocolic fistula, and by carcinoma of the pancreas. Although the primary carcinomas of the first and second portions of the duodenum are rarely found invading the pylorus, perhaps because they are so uncommon, squamous cell epitheliomas arising from the distal end of the esophagus regularly invade the cardia. Indeed, any malignant tumor arising in any of the other tissues which surround the stomach may press upon it, producing deformity of its contour, or may actually invade it.

References


1Pathologist of the St. Francis Hospital, Wichita, Kansas.
TREATMENT

It is beyond the scope of this fascicle to discuss treatment except in so far as it is influenced by the pathology of tumors. For carcinoma, treatment may have either one of two objectives: palliation or cure. If the case is considered incurable, more or less of the stomach may be removed in order to get rid of a large ulcerating tumor which has caused loss of appetite, weight, and strength, anemia from blood leakage, obstruction and all the distressing train of symptoms coincident with it. Weight, strength, and appetite may be regained and the remaining months of life made much more tolerable as a result. If cure is attempted it is obvious that this will only be obtained if all of the stomach tumor with all of whatever metastases have occurred can be successfully removed. When the tumor is in the distal part of the stomach and toward the greater curvature, it is not so much invasion of the deeper layers of the duodenum that leads to failure as metastases in the peripancreatic nodes. Consequently, here, removal of duodenum and head of the pancreas may be needed to make possible the removal of these nodes. On the lesser curvature side at the pylorus, extension toward the liver may make necessary removal of part of that organ. But unless extension or metastasis or both have gone far along the lesser curvature, removal of the cardia and lower mediastinal nodes does not seem called for. Carcinomas of the midportion and cardiac end of the stomach usually are not cured, either because metastases involve the lymph nodes above the diaphragm or because of direct or lymphatic extension in the esophagus above the line of resection. Gastric carcinomas sometimes invade directly into the pancreas, gastrocolic omentum, transverse colon, gastrohepatic omentum, and liver. The presence of such invasion does not necessarily mean incurability, since these structures can be removed in part or, with the exception of the liver, in toto, without fatal results. The linitis plastica type of stomach carcinoma is somewhat akin to cancer en cuirasse in the breast; it means wide extension throughout the entire stomach both directly and in lymphatics. Any procedure designed to cure must include total gastrectomy and the removal of as many lymph node groups as can be accomplished. The studies which have been carried out at the Presbyterian Hospital suggest, however, that these more
radical procedures will probably increase the cure rate by very little because metastases at a distance and beyond the reach of the surgeon have already taken place when the patient reaches the operating table. Of 60 patients who have survived for over five years following various types of gastric resection, in 40 no lymph node metastases were found. Sixteen had one, two, or “few” nodes involved and only four had three or more metastatic nodes in the operative specimen.

Leiomyosarcoma is usually found in the stomach wall and the local tumor can be removed without much difficulty unless it has become adherent to or invades surrounding structures, in which case a very radical operation will often fail, because of blood-borne metastases. If the nodule is believed benign and a simple excision is contemplated, it will be wise to do a quick frozen section at operation in order to look for mitoses. If they are easily detected, simple excision may fail to cure and a partial gastrectomy is indicated.

Lymphosarcoma primary in the stomach, if it happens to belong to the small class which are biologically slow to spread or metastasize, may be clinically cured by resection or radiotherapy or a combination of the two. Indeed a patient has been followed at the Presbyterian Hospital treated by incomplete excision and nothing else, without evidence of recurrence in the remaining 19 years of his life (figs. 49–51). The behavior of these cases is therefore unpredictable.

It is, of course, necessary only to remove benign tumors in order to cure them. This is especially important for adenomatous polyps, because definitely they must be considered precancerous tumors, and for leiomyomas, both because of the frequency with which their ulceration is associated with severe hemorrhage and also because they may become malignant. It is possible that gastritis polyposa may be a precancerous lesion, and this must be considered in any discussion of its treatment.

Reference