THE ROENTGEN DIAGNOSIS OF CARCINOMA OF THE PANCREAS

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The accuracy of the roentgenological method in the diagnosis of carcinoma of the gastro-intestinal tract is now fully recognized. Among the few abdominal viscera that do not yield to ready investigation by roentgen rays, the pancreas stands at the head of the list. There being no method available to make this organ sufficiently radiopaque to be visualized, recourse must be had to the indirect signs of pressure and encroachment on neighboring viscera for the demonstration of tumors arising from it. That such a method is considered subject to many inaccuracies and of questionable value, is attested by the few articles to be found in the literature, especially American, on this subject. Since the clinical diagnosis of tumors of the pancreas is often difficult, any aid which the roentgenologist can give is fully appreciated. A review of this problem together with the analysis of a group of twenty-three cases observed during the past seven years and the correlation of the roentgen and pathological findings will be presented.

REVIEW OF LITERATURE

Dickson (7), in 1923, described the pressure deformities that might be produced on the stomach and duodenum by carcinoma of the pancreas. The only previous articles that he could find were by Hickey and by Herrenheiser of Vienna. In Dickson's opinion this lesion produced a displacement of the pylorus upwards and to the left, and of the descending duodenum to the right. The descending duodenum would show an irregular contour, would be fixed and might present areas of constriction and dilatation. While cysts might produce the same appearance, in his opinion the pressure deformity in this latter condition was smoother and more clear-cut. When the tumor occurred in the body of the gland, the transverse duodenum would show the effects of pressure with loss of the valvulae conniventes. With involvement of the tail the pressure deformity would occur on the lesser curvature of the stomach. Dickson believed that routine gastro-intestinal examination, following a barium meal, would give more information than could be obtained with pneumoperitoneum, and with less discomfort to the patient.

Butler and Ritvo (5) described the characteristic displacement of the duodenum occurring in tumors of the head of the pancreas, resulting in a widening or enlargement of the duodenal curve. An additional finding in some cases was narrowing and flattening of the descending duodenum.

Rigler (11) emphasized the value of demonstrating the enlargement of the duodenal curve and stated that about one-half of the cases of carcinoma of the head of the pancreas observed by him showed such a displacement. Oc-
casional cases were seen in which actual invasion of the duodenal wall could be visualized, a deformity which might be difficult to distinguish from primary carcinoma of the duodenum. Rigler found that tumors of the body and tail tended to displace the stomach upward and forward and the transverse colon downward. Brown (3) advocated the use of lateral views in localizing abdominal masses.

Among other methods of visualizing the pancreas pneumoperitoneum has had numerous advocates. When a proper technic is employed, this method apparently yields results of a high order, but because of the discomfort suffered by the patient and the dangers due to the injection of the gas, it seems to have been largely discarded.

Recently Engel and Lysholm (8) have described their method of visualizing the pancreas in relief by the insufflation of the stomach with gas. They employ effervescing powders as the source of the gas and take lateral films of the abdomen with the patient prone. Normally the space occupied by the pancreas is of about the same thickness as the adjacent vertebral bodies. Any increase in this space, bounded anteriorly by the posterior wall of the stomach and posteriorly by the anterior edge of the vertebral column, is considered suggestive of enlargement of the pancreas. In some instances the increase in this space is marked and the nodular protrusion of the tumor into the gas shadow of the stomach can be readily visualized.

Wiese and Larimore (13), in a discussion of extra-alimentary tumors, reviewed 18 cases of pancreatic tumor: 8 cysts and 10 carcinomas. Fourteen of the tumors were recognized by roentgen examination, but it is significant that among the 18 cases, a mass was palpable in 15. In the 3 cases without a palpable mass the roentgen diagnosis was incorrect. These authors believe that enlargement of the duodenal curve is most often due to a tumor of the pancreas. Bird (1), on the other hand, has stated that such enlargement is usually due to infection or to tumors of the retroperitoneal lymph nodes.

Haring (9) has reviewed the roentgen findings in various diseases of the pancreas. Writing of the diagnosis of carcinoma, he describes the usual signs mentioned by others and calls attention further to the difficulty of differentiating a normal highly situated stomach with a low-hanging duodenum, as seen in the obese, from pressure deformities due to tumor. His article contains a good bibliography, especially of the foreign literature.

Borak (2) utilizes cholecystography as a method of investigation in tumors of the pancreas. He states that in the early stages, before the common duct is completely occluded, the gallbladder will be found to be enlarged, and the shadow will persist an abnormally long time, as will the presence of the dye in the hepatic flexure of the colon. When complete occlusion occurs, no filling of the gallbladder will be obtained and there will be no stasis of dye in the colon.

**Review of Cases**

Records were available on 23 cases seen during the past seven years in which the diagnosis of carcinoma of the pancreas was made on operative or post-mortem findings and in which roentgen examination of the stomach had been done. Cases in which no proof of the correctness of the diagnosis was
<table>
<thead>
<tr>
<th>Case</th>
<th>Preliminary clinical diagnosis</th>
<th>X-ray examination</th>
<th>Operative or autopsy findings</th>
<th>Correctness of X-ray diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. M. J.</td>
<td>Carcinoma of stomach</td>
<td>Mass above the pylorus and extrinsic to the stomach</td>
<td>Operation: Carcinoma of head of pancreas</td>
<td>±</td>
</tr>
<tr>
<td>2. W. H.</td>
<td>Malignancy with obstruction of common duct</td>
<td>Examination unsatisfactory. Re-examination asked for but not done</td>
<td>Autopsy: Carcinoma of head of pancreas with obstruction of common duct and duodenum</td>
<td>±</td>
</tr>
<tr>
<td>3. J. E.</td>
<td>Carcinoma of the stomach</td>
<td>Mass enlarging duodenal curve and arising in region of head of pancreas</td>
<td>Autopsy: Carcinoma of head of pancreas with invasion of duodenal wall below the ampulla</td>
<td>+</td>
</tr>
<tr>
<td>4. A. P.</td>
<td>Malignancy, intra-abdominal. Location?</td>
<td>Obstruction at pylorus. Review of films shows antrum displaced to left and smooth pressure defect on greater curvature</td>
<td>Operation: Mass involving head of pancreas; pyloric obstruction; no biopsy</td>
<td>±</td>
</tr>
<tr>
<td>5. J. S.</td>
<td>Carcinoma of pancreas</td>
<td>Negative</td>
<td>Autopsy: Adenocarcinoma of head of pancreas; 6.5 cm. ulcer crater in duodenum, 4 cm. below pylorus and continuous with tumor growth in pancreas</td>
<td>–</td>
</tr>
<tr>
<td>6. G. H.</td>
<td>Carcinoma of stomach with pyloric obstruction</td>
<td>Dilated stomach; pyloric obstruction; duodenal ulcer</td>
<td>Autopsy: Carcinoma of head of pancreas with invasion of duodenum</td>
<td>±</td>
</tr>
<tr>
<td>7. W. H.</td>
<td>Carcinoma of stomach or pancreas</td>
<td>Filling defect at pylorus, probably carcinoma of stomach</td>
<td>Autopsy: Carcinoma of pancreas; duodenum adherent but not encroached upon</td>
<td>±</td>
</tr>
<tr>
<td>8. J. C.</td>
<td>Chronic cholecystitis with stones</td>
<td>Encroachment of descending duodenum; slight enlargement of curve; early changes in mucosal pattern of duodenum</td>
<td>Operation: Mass in region of head of pancreas, probably carcinoma, no biopsy</td>
<td>+</td>
</tr>
<tr>
<td>9. M. K.</td>
<td>Carcinoma of head of pancreas</td>
<td>Mass in region of head of pancreas causing pressure deformity on antrum and bulb</td>
<td>Autopsy: Carcinoma of head of pancreas with obstruction of pancreatic and hepatic ducts</td>
<td>+</td>
</tr>
<tr>
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<tr>
<td>10. C. L.</td>
<td>Carcinoma of pancreas</td>
<td>Negative</td>
<td>Operation: Carcinoma of pancreas the size of a lemon; metastases to gastro-hepatic omentum</td>
<td>−</td>
</tr>
<tr>
<td>11. N. C.</td>
<td>Carcinoma of stomach?</td>
<td>Indefinite. Large six-hour residue</td>
<td>Operation: Mass the size of a child's head in region of pancreas; duodenum partially obstructed in second portion</td>
<td>±</td>
</tr>
<tr>
<td>12. G. H.</td>
<td>Carcinoma of pancreas?</td>
<td>Obstructive lesion of duodenum close to pylorus due to encroachment by carcinoma of pancreas</td>
<td>Operation: Orange-sized mass in region of head of pancreas blocking bile duct and duodenum</td>
<td>+</td>
</tr>
<tr>
<td>13. M. C.</td>
<td>Carcinoma of pancreas</td>
<td>Small pressure defect on lesser curvature side of fundus. Re-examination wanted but not done</td>
<td>Operation: Carcinoma of head of pancreas; nodule in left lobe of liver</td>
<td>±</td>
</tr>
<tr>
<td>14. R. S.</td>
<td>Carcinoma of gastro-intestinal tract</td>
<td>Negative except for large six-hour residue</td>
<td>Autopsy: Carcinoma of head of pancreas with metastasis to liver. Mass was adherent to posterior wall of stomach</td>
<td>±</td>
</tr>
<tr>
<td>15. A. S.</td>
<td>Malignancy of gallbladder or liver</td>
<td>Mass above and to the right of the duodenal bulb, thought to be gallbladder or liver</td>
<td>Operation: Carcinoma of head of pancreas with extension into the body of the gland</td>
<td>±</td>
</tr>
<tr>
<td>18. P. L.</td>
<td>Obstruction of common duct. Stone or malignancy?</td>
<td>Enlarged duodenal curve; upward displacement of antrum; early changes in pattern of duodenal mucosa</td>
<td>Operation: Hard mass in head of pancreas; metastasis to liver</td>
<td>+</td>
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Table I: Roentgen, Operative, and Autopsy Findings in Pancreatic Carcinoma—Continued

<table>
<thead>
<tr>
<th>Case</th>
<th>Preliminary clinical diagnosis</th>
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</tr>
</thead>
<tbody>
<tr>
<td>19. C. B.</td>
<td>Arteriosclerotic heart disease; gastro-intestinal tuberculosis</td>
<td>Small prepyloric defect. Early carcinoma of stomach or hypertrophy of pylorus? Examination just before death showed partial high intestinal obstruction</td>
<td>Autopsy: Carcinoma simplex of pancreas; also early adenocarcinoma of stomach</td>
<td>±</td>
</tr>
<tr>
<td>20. L. D.</td>
<td>Carcinoma of stomach or colon</td>
<td>Small pressure defect on lesser curve of stomach; duodenum normal</td>
<td>Autopsy: Carcinoma of pancreas near head, duct type; metastasis to regional nodes</td>
<td>±</td>
</tr>
<tr>
<td>21. W. S.</td>
<td>Carcinoma of lung</td>
<td>Negative</td>
<td>Autopsy: Carcinoma of pancreas with metastasis to hilum nodes of the lung</td>
<td>—</td>
</tr>
<tr>
<td>22. V. B.</td>
<td>Carcinoma of pancreas</td>
<td>Slight enlargement of duodenal curve due to tumor in region of head of pancreas</td>
<td>Autopsy: Small carcinoma of head of pancreas</td>
<td>+</td>
</tr>
</tbody>
</table>

available are not included in this group. The clinical, operative, or post-mortem findings in these 23 cases were reviewed. Films of many were still available and were also examined and checked against the roentgen report. This material is presented in Table I.

In the second column of the table is listed the preliminary clinical diagnosis, i.e., the tentative diagnosis made by the clinician before any laboratory data were available. While no attempt will be made in this paper to discuss the clinical aspects of carcinoma of the pancreas, a review of the diagnoses offered in these cases shows some significant findings. It will be seen that while in a very large percentage of cases the patient was suspected of having an intra-abdominal malignancy, yet in a fairly high number either some other organ, as the stomach or colon, was thought to be the primary site or else no statement at all as to the location of the tumor could be made. It is in such cases that roentgen examination may yield valuable information, not only in ruling out the gastro-intestinal tract, but also, in some instances, indicating the pancreas very definitely as the site of the tumor.

Operative and post-mortem reports are briefly summarized in column four, while in the last column is indicated the correctness of the roentgen examination. A plus sign indicates that the roentgen findings were correctly inter-
interpreted as indicating a mass in the pancreas. There were 8 cases giving such signs and so interpreted (34.8 per cent). Those cases in which the examination was entirely negative are indicated by a minus sign. Only 3 are so grouped. The sign + designates all of the remaining cases, in which there were abnormal findings which were either misinterpreted or concerning which no definite conclusion could be drawn.

In reviewing the roentgen reports and films in these cases and in others with positive roentgen evidence but no proof, it was found that the classic sign of enlargement of the duodenal curve was often absent. On the other hand, only 3 cases gave absolutely negative findings, leaving a majority of

![Image](https://via.placeholder.com/150)

**Fig. 1. Case 1: Duodenal Bulb Blanched by Pressure from Mass Posterior and Above It**

Transverse duodenum crosses at level of pylorus (marked x). FF = duodenal flexures. At operation the mass was found in the head of the pancreas.

14 in which other positive evidence was present. This was frequently misinterpreted or at least was not considered definite enough at the time to indicate the pancreas unequivocally. More careful evaluation undoubtedly would in some instances have led to the correct diagnosis. In this respect attention is called to two cases (No. 1 and 15) in which a small palpable mass was present directly above the duodenal bulb causing downward displacement of the latter and of the pylorus.

The following case (No. 1) is illustrative:

The patient was a white female, sixty-eight years of age, whose chief complaint was pain in the abdomen. The onset had occurred about six weeks previously with a head cold. The pain was not severe and was fairly generalized throughout the abdomen. There had been a loss of weight of 10 to 15 pounds. A lump in the epigastrium had been discovered two weeks prior to admission. The physical examination revealed marked emaciation and a palpable mass in the mid-epigastrium. Gastric analysis gave a total acidity of 22 and free acid of 20. On gastro-intestinal x-ray examination, the mass was found to lie above the
pylorus and duodenal bulb, causing some downward displacement of these structures (Fig. 1). It was thought to be in the gallbladder or liver. At operation the head of the pancreas was found to be the size of a baseball and the entire pancreas was hard and nodular. A biopsy was taken and the microscopic diagnosis was malignant adenoma of the pancreas.

The reason for the downward displacement in this instance lies in the fact that the stomach was of the elongated "J" type. The descending duodenum was short, so that the third or transverse portion crossed behind at the level of the pylorus. Obviously any enlargement of the head of the pancreas could cause only such a downward displacement, and since the curve of the duodenum was noticeably small and flat to begin with, a reasonable degree of enlargement or rounding out could occur without being noticeable. Here, however, the location of the mass above the transverse duodenum should have given the clue to the proper diagnosis without regard to the direction of gastric or bulbar displacement. This type of stomach and associated duodenal position is not an uncommon one, as a review of a series of normal roentgenograms will show.

A second source of difficulty arises when complete or nearly complete obstruction exists. If this is at the pylorus, it is difficult, if not impossible, to determine the nature of the obstructive lesion. This is not a frequent situation. The obstruction more commonly occurs in the mid portion of the descending duodenum in cases of carcinoma of the head of the pancreas and in the transverse or ascending portion when the tumor is located in the body of the gland. It should be possible in most instances to demonstrate the approximate location of the obstruction and thereby eliminate gastric carcinoma or duodenal ulcer as causes.

**Fig. 2. Case 22: Typical Rounding Out of Duodenal Curve by Small Mass in Head of Pancreas; No Duodenal Obstruction**

At autopsy a small carcinoma of the head of the pancreas was found.
Roentgen Diagnosis

The roentgen signs of pancreatic tumor may be discussed under two headings, depending upon whether or not a mass is palpable. The presence of a mass renders the diagnosis less difficult, since its relation to the duodenum usually can be determined. In lesions involving the head the mass will be found within the duodenal curve (Fig. 2). While displacement of the duodenal bulb and pylorus upwards and of the gastric antrum to the left is the rule, the opposite condition may be found in case of a low-hanging stomach with a high duodenal curve, so that the classical picture, as described in the literature, may not always be present. Tumors of the body of the gland may displace the stomach and third and fourth portions of the duodenum forward.

![Case 18: Mass in Head of Pancreas Pushing Antrum to the Left and Upwards](image)

**Fig. 3. Case 18: Mass in Head of Pancreas Pushing Antrum to the Left and Upwards**

Note narrowing of descending duodenum, indicated by arrows. This illustrates the typical appearance of carcinoma of the head of the pancreas with early involvement of the duodenum.

The stomach is not a fixed organ and its displacement by a mass lying behind it need not always be in the same direction, that is, up or down. We have seen one case of a large pancreatic cyst which produced a smooth pressure deformity on the lesser curvature and no anterior displacement or compression. At autopsy the cyst was found to occupy the lesser omental space, pushing the stomach to the left and lying within the lesser curvature. A similar case of this type has been reported by Bruck (4). The duodenum, being relatively more fixed, is likely to show a more constant deviation. The lateral view, in these cases, should be particularly helpful. Other findings, to be discussed later, may give additional aid.

If no mass is palpable there may be no positive roentgen evidence. If the tumor is of the diffuse infiltrating variety, no change from the normal can be expected. In all other cases, if the tumor has reached an appreciable size,
displacement phenomena should be present. An important finding in some cases is the abnormal palpability of the stomach when the patient is examined in the upright position (10). Even though no definite mass can be felt, the ease with which light pressure can efface the barium shadow in the antrum should lead to a suspicion of a retrogastric mass. In these cases a lateral view will be of great value and may demonstrate the compression of the stomach from behind and its forward displacement. If the tumor has invaded the duodenal wall, a distinct change in the mucosal pattern is produced. This

**FIG. 4. CASE 8: A. EARLY ENCROACHMENT OF DESCENDING DUODENUM, INDICATED BY ARROW; SLIGHT DILATATION ABOVE; NO APPRECIABLE ENLARGEMENT OF DUODENAL CURVE. B. SAME CASE LATER, AFTER CHOLECYSTO-DUODENOSTOMY AND GASTRO-ENTEROSTOMY**

When the later roentgenogram was made obstruction in the duodenum was complete. Air in the gallbladder indicates patency of the gallbladder-duodenal stoma. A case of carcinoma of the head of the pancreas.
may vary from slight irregularities to complete obstruction (Figs. 3 and 4). In early partial obstruction there is delay in the passage of the bolus through the constricted area with some dilatation proximal to it, and churning movements will be observed. Occasionally a spurt of barium can be seen passing through the area of narrowing. Such observations are not characteristic of any particular type of obstruction, and if this is the only finding an etiological diagnosis may be impossible. If the carcinoma has reached this stage of growth, other changes may be present and help to limit the diagnostic possibilities.

Vorhaus (12) reported a case where the only roentgen evidence was a partial obstruction in the transverse duodenum. At autopsy the body and tail of the pancreas were found to be destroyed and replaced by tumor tissue. No actual extension into the duodenum was found.

Other signs of secondary importance are due to alterations in the physiology of the stomach and intestine. A slowing of gastric peristalsis, especially in the later stages of the disease, seems to be of frequent occurrence. We have also been impressed with the slow motility of the small intestine even when no positive evidence of actual obstruction in the duodenum was present. It is common to find the head of the meal still in the terminal ileum at six hours, though the stomach and duodenum are empty. This, of course, cannot be considered of primary importance, since many other conditions may cause such a diminished motility. The frequency of occurrence in pancreatic carcinoma, however, seems to warrant attaching some importance to it, and its presence should lead to a careful search for more positive evidence.
DIFFERENTIAL DIAGNOSIS

Although Dickson and others describe the different appearances that may be found in benign and malignant tumors, it would seem that in many instances a differentiation between the two types of growth may be impossible. If the tumor is very large, its benign character may be surmised from the smooth, rounded character of the mass and associated pressure deformity. If the lesion is small, the roentgenologist may do well even to demonstrate its presence without being able to determine its true nature. Correlation with the clinical findings is helpful in these instances, since the patient with a malignant lesion usually presents the general symptoms and signs of malignancy.

Differentiation from cancer of the pancreas is difficult without the aid of clinical findings.

The difficulty in differential diagnosis between benign cysts and malignant tumors is well illustrated by the following case (No. 23):

A white male, aged thirty-one, complained chiefly of pain in the lower back. The onset occurred about nine months previously, when he slipped while lifting a heavy weight. The condition improved slowly but was again aggravated by injury six months later and he was hospitalized for one month without appreciable relief. On physical examination a mass the size of a large orange was found in the upper central abdomen. The patient had not been aware of this. The results of examination otherwise were essentially negative. X-ray studies of the gastro-intestinal tract revealed the mass lying posterior to the pyloric end of the stomach. It enlarged the duodenal curve and pushed the gastric antrum and duodenal bulb upward and to the left. There was no obstruction of the duodenum (Fig. 5). The diagnosis was a retroperitoneal epigastric mass suggesting a cyst of the head of the pancreas. Exploratory laparotomy was done. The mass felt soft and cystic but on aspiration no fluid was obtained. A biopsy was taken and was reported as an adenocarcinoma.
General enlargement of the liver causes displacement of the stomach and duodenum to the left and posteriorly. Local masses in the liver may produce a downward displacement of the pylorus and duodenal bulb similar in some instances to that associated with carcinoma of the head of the pancreas as described, but pressure effects and displacement of the transverse duodenum are absent and the mass cannot be outlined throughout its circumference. Any retroperitoneal tumor arising in the region of the pancreas may cause effects very similar to carcinoma of the pancreas. The most common lesion of this type in our experience is metastatic involvement of the lymph nodes. Usually the mass of nodes is more irregular in extent and does not conform in position to the pancreas, but in many instances differentiation is impossible (Fig. 6).

Primary carcinoma of the duodenum is rare. Its roentgen appearances have been described by Crane (6) and others. There is an absence of duodenal displacement, with the main findings consisting of irregular constriction and distortion of the mucosal pattern. The diagnosis of such a lesion would seem to be difficult and it might readily be confused with pancreatic neoplasm. Other constricting lesions of the duodenum must also be considered. These include acquired adhesions and congenital bands, pressure from the superior mesenteric vessels and from deformities of the spine. Here, too, absence of pressure effects characteristic of a mass may be the only clue to the correct diagnosis and in the absence of such pressure effects pancreatic carcinoma should not be given much consideration.

Tumors of the left kidney may simulate the changes produced by carcinoma of the body of the pancreas. The deformity is usually seen in the middle portion of the body of the stomach or, in the case of a lesion in the
upper pole of the kidney, along the lesser curvature. If a pressure defect is found in these areas, and the kidney is suspected of being the site of a primary lesion, pyelography may be the deciding factor in arriving at a correct diagnosis.

The use of gas as a contrast medium, according to the method advocated by Engel and Lysholm (8), would seem to be a valuable procedure, since it has yielded good results in their hands. The difficulty is that it is not applicable as a routine method of study of the gastro-intestinal tract. Since many cases of carcinoma of the pancreas are not recognized clinically in their earlier stages, the usual barium meal examination is called for, and unless some positive findings are present, the examiner does not know which cases may need such an added examination. In those patients in whom intra-abdominal malignancy is suspected clinically, and in whom the stomach and colon are found to be normal on roentgen examination, further investigation according to this method should be helpful.

Carcinoma of the transverse colon was incorrectly diagnosed as carcinoma of the pancreas in one case where only a gastro-intestinal examination following the oral administration of barium was done. There was a pressure deformity on the greater curvature of the antrum with apparent slight enlargement of the curve of the duodenum, duodenal stasis, and tenderness limited to this area. At operation a carcinoma of the transverse colon was found adherent to the duodenum and in close approximation to the antrum of the stomach. This error would probably have been avoided if a barium enema had been given and the fault lies in failure to examine the entire gastro-intestinal tract. Mesenteric cysts have been mentioned as causing diagnostic errors. Observation in the lateral view as advocated by Brown should be helpful in differentiating these lesions.

Fig. 8. Case 16: Stomach and Duodenum Normal to X-ray Examination, though Autopsy Showed Carcinoma of the Head of the Pancreas
Probably the greatest difficulty arises in trying to differentiate between early pressure deformities and the normal in an obese individual or in others in whom the stomach is abnormally high due to a distended or highly located transverse colon. The elevation of the gastric antrum causes the duodenal curve to appear unduly large and in the obese the curve is normally larger and rounder due to the presence of fat (Fig. 7). For this reason, the habitus of the individual and the type and position of the colon should be considered in the final evaluation.

CONCLUSIONS

A review of a series of 23 cases of carcinoma of the pancreas shows that while a majority give some evidence of the presence of the neoplasm when studied by means of a barium meal, yet this evidence is often difficult to evaluate and may even be misleading. A smaller number (34.8 per cent in this series) will give unequivocal findings which will be found to be highly accurate. More careful observation and correlation of the cases here reviewed, at the time of the examination, would probably have led to a higher number of correct diagnoses. Since the diagnosis depends mainly upon the secondary effects of the tumor on the stomach and duodenum, the degree of accuracy will not be nearly as high as it is, for instance, in gastric carcinoma. Errors in diagnosis seem unavoidable; not only will carcinoma of the pancreas be missed but other lesions will occasionally be interpreted as such. In final analysis it would seem best to make reports conservatively. A statement of the positive findings and the conclusion that these are compatible with a mass in the region of the pancreas will be as far as the roentgenologist can safely go in most cases.

SUMMARY

1. The roentgen and pathological findings in 23 cases of carcinoma of the pancreas have been reviewed and the results presented in tabular form.
2. The roentgen diagnosis and differential diagnosis are discussed.
3. The classic picture of enlargement of the duodenal curve was frequently absent. With certain types of stomachs actual downward displacement of the antrum and pylorus may be present instead.
4. Differential diagnosis between carcinoma of the pancreas and other masses in this region is difficult and often impossible on roentgen examination; close correlation with the clinical findings is therefore necessary.

BIBLIOGRAPHY

1. Bird, C. E.: Tumors which may expand the curvature of the duodenum, particularly tumors and infections of the retroperitoneal lymph nodes, Ann. Surg. 89: 12, 1929.


