The Clinical Significance of Duodenal Diverticula

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IN 1710 CHOMEL[1] reported a case of diverticulum of the duodenum which he had found at postmortem examination of an 80-year-old woman who had died of apoplexy. The diverticulum contained 22 gallstones. (It is interesting that Chomel was concerned more with the stones than the diverticulum. He believed that chyme, undigested—and for that reason more prone to form a solid mass—and hardened by bile and pancreatic juice which were unconditioned for one another, could give rise to the first stone, which was attached to the duodenal mucosa. The duodenal wall was forced to bulge in order to accommodate the stone, and so a sac was formed. Additional stones were deposited in the same manner). Subsequent reports of duodenal diverticula were rare and sporadic until roentgenologic examination of the gastrointestinal tract came into common use.

According to Bremer,[2]

> Diverticula develop as minute buds from the epithelium of the gut into the subepithelial connective tissue, chiefly on the antimesenteric surfaces. In their formation they somewhat resemble the intestinal glands and normally disappear; or they may increase in size, become expanded at the distal end and either remain connected with the lumen by a narrow pedicle or become separated as a closed cyst; or they may pierce the circular muscle fibers along one of the clefts by which the vessels make their way to supply the mucosa. Once outside the circular muscles a cyst can spread into the intermuscular tissue and lift up the outer muscle layers to form a dome, or it may pierce the longitudinal muscle and be covered only by the serosa. The presence or absence of muscle fibers in the wall of the cyst indicates which of these methods it has followed. In either case it can expand freely in the peritoneal or pleural cavity. The type just described is the only one to which a developmental origin can be ascribed.

Cunningham[3] stated that

> Diverticula may be protrusions of the mucous and submucous coats through the muscular wall termed "false" diverticula or they may be "true" diverticula in which all of the coats are represented. They are usually situated on the aspect of the duodenum which is in contact with the pancreas and frequently in the neighborhood of the orifice of the bile duct. Some may be due to pressure from the interior of the duodenum but most are congenital in origin and are possibly associated with diverticula which give rise to the liver and pancreas.

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Perry and Shaw[4] described noninflammatory pouches consisting of mucosa and serosa with or without muscle fibers, and inflammatory pouches with adhesions to the serosa and ulceration of the mucosa. In none of their cases did a noninflammatory diverticulum appear to have produced symptoms.

It would seem that Cunningham's classification of true and false diverticula is anatomically and clinically unsound, and that Bremer's interpretation is more accurate and practical. The term "false" diverticula should be reserved for pouches formed by ulceration, perforation, or necrosis, and walled off by adhesions.

Nagel[5] found diverticula in 2.2% of the patients autopsied at the Mayo Clinic from 1922 to 1924. This incidence is more or less that in the general population.

Diverticula of the duodenum are most common in the descending portion, and about 95% of these arise from the medial surface. Frequently a diverticulum is in contact with the pancreas; it may be embedded in its surface. Bilateral diverticula arising from both the medial and lateral surfaces are extremely rare (Fig. 1–3).

COMPLICATIONS AND SYMPTOMS

A diverticulum is lined with intestinal epithelium, but it may also contain aberrant pancreatic, gastric, or other functioning tissue, so that the potentiality of medical or surgical complications is inherent. Ordinarily, diverticula are regarded as interesting anatomic "accidents" of no clinical importance. On occasion, however, they may be the site or the sign of a

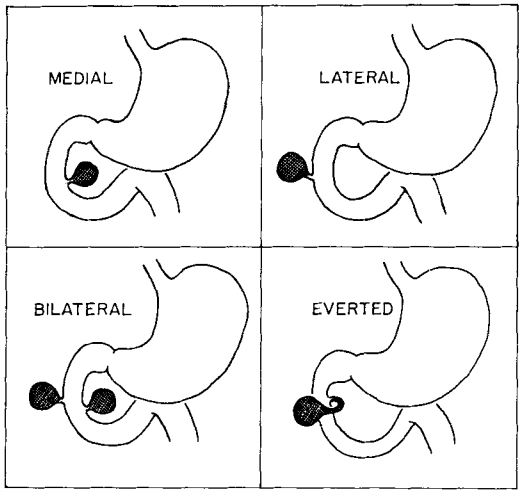

Fig. 1. Schematic representation of diverticula arising from the descending duodenum.

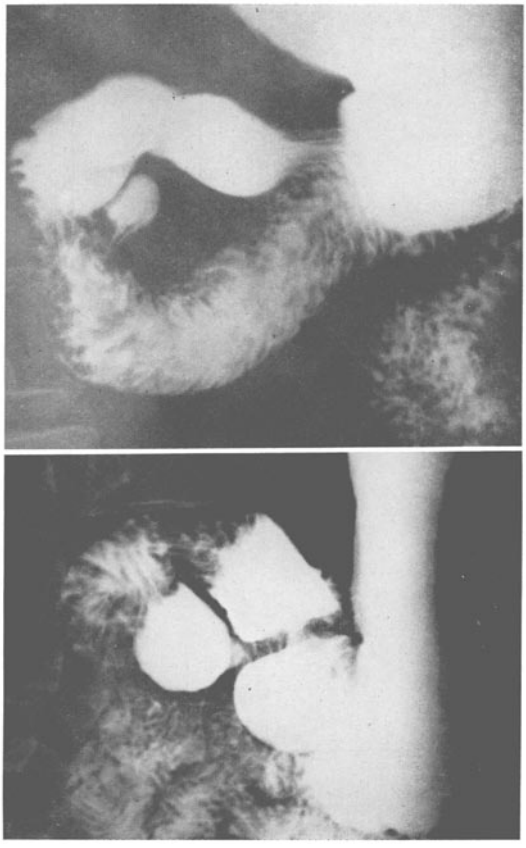

Fig. 2. The most common varieties of diverticula. The smaller (*top*) rarely produce symptoms. Note the mucosal folds in both, which confirm their identity as true diverticula.

pathologic process. There is general agreement that the smaller outpouchings are less likely to produce symptoms. Food or foreign bodies retained in a diverticulum may cause ulceration or perforation. Because of the anatomic relationships to the structures in the region where diverticula are most commonly found, intermittent attacks of pain and jaundice may result from compression of the common duct and duct of Wirsung. Cattell and Mudge[6] described a case in which the diverticulum contained undigested celery which had been present for 48 hours. Jones and Merendino[7] reported an interesting case of a 50-year-old obese woman who had repeated attacks of severe, gnawing right-upper-quadrant pain associated with jaundice. She had previously had a subtotal gastric resection for a perforated duodenal ulcer. There was spasm at the anastomosis when the diverticulum was filled. The patient was still free from symptoms 1½ years after the diverticulum was resected.

While diverticula are often asymptomatic, they may produce symptoms

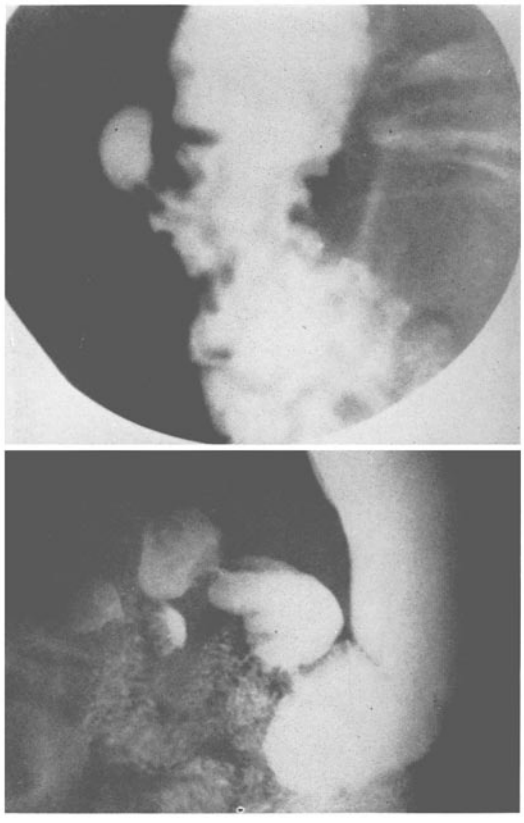

Fig. 3. (*top*) A lateral diverticulum; note mucosal folds. These diverticula are usually fixed by abnormal, congenital peritoneal attachments. (*bottom*) Bilateral diverticulum (extremely rare); mucosal folds of these diverticula are clearly seen on the original film.

usually described[7] as follows: (1) sharp, cutting, gnawing, or cramping pain in the epigastrium or right upper quadrant, worse 2–4 hours after eating; (2) vague digestive disturbances: bloating or belching; (3) bleeding (melena), usually due to peptic ulceration of the diverticulum; (4) weight loss; (5) nausea and vomiting (reflex pylorospasm); (6) diarrhea; (7) jaundice; and (8) tenderness over the diverticulum (a sign of diverticulitis).

The average duration of symptoms is 6 years. Cattell and Mudge are of the opinion that resection is probably indicated if symptoms are associated with stasis in the diverticulum (retention of barium for more than 6 hours).

CASE REPORTS

Case 1

A man aged 59 had complained of pain in the epigastrium for 3 years. The pain formerly had been relieved by food, but in the past month it had become more or less con-

stant and radiated directly through to the back. His physician had prescribed medication and various diets but had never requested an X-ray examination. While on a brief visit to another state, the patient had an attack of severe epigastric pain and melena. He consulted a local physician and was referred for X-ray examination. We found a large ulcer in the first portion of the duodenum. There was also a large diverticulum of the second portion of the duodenum, and it too contained a good-sized ulcer niche (Fig. 4). Circumstances necessitated the institution of medical treatment. The patient is still free from symptoms 1 year later.

Comment

An ulcer in a duodenal diverticulum is commonly associated with an ulcer in the cap. If one is noted, a diligent search must be made for the other.

Case 2

A man aged 56 was admitted with a complaint of heartburn, "acidy feeling" in his chest, and the passage of dark, tarry stools. X-ray examination elsewhere 2 years previ-

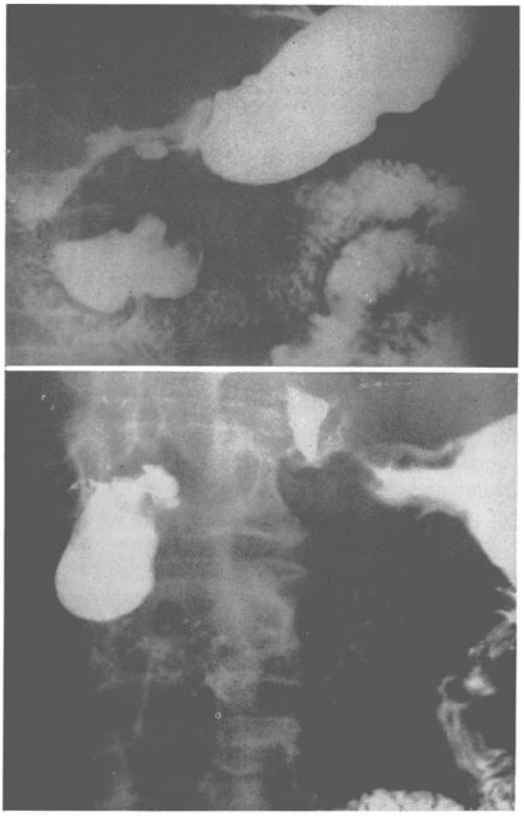

Fig. 4. Case 1. Peptic ulcer of the duodenal cap and peptic ulcer of a duodenal diverticulum. Note mucosal folds of the pedicle.

Fig. 5. Case 2. Peptic ulcer of the duodenal cap and peptic ulcer of a duodenal diverticulum. The latter ulcer is probably fixed to the pancreas, so that the diverticulum is stretched by the weight of its contents. The overlying diverticulum obscures the mucosal folds of its pedicle. The duodenal loop is widened probably as a result of pancreatitis.

ously had been reported as "negative." We found a duodenal ulcer. There was also a large, elongated diverticulum of the descending dudoenum. In its upper medical border there was a large, irregular ulcer crater (Fig. 5). The patient was placed immediately on a rigid medical regimen. In the 2 months that have elapsed, he has shown steady and progressive improvement. At present he is symptom-free.

Comment

We have not had opportunity to study the X-ray films taken 2 years previously. They undoubtedly showed the diverticulum; and since most diverticula are asymptomatic, a "negative" diagnosis may have been justified. Careful study of the present films (Fig. 5) shows an unusual elongation of the pouch and widening of the duodenal loop. This probably means that the bed of the ulcer crater (of the diverticulum) lies in the pancreas, that there is an associated low-grade pancreatitis, and that the pouch is stretched by the weight of its contents.

Thorek[8] reported a case of a man who had typical ulcer symptoms. A diagnosis of duodenal ulcer was made by X-ray examination. Operation revealed, in addition to the duodenal ulcer, a diverticulum of the descending duodenum containing a large ulcer crater embedded in the pancreas. Excision of the diverticulum and pancreatic bed and a gastrojejunostomy were performed. The patient did well after operation.

Case 3

A woman aged 61 had complained of biliousness and abdominal pain for about 20 years. The pain was in the right umbilical region and back. It was usually worse 2–3 hours after eating and was always worse when she was in bed. Recently, while in bed, she had had an attack of pain in the back which was so severe that she was forced to get up and walk about. Her physician gave her an injection to stop the pain and on the next day referred her for X-ray examination. We found a large diverticulum of the descending duodenum which contained a mass—probably aberrant pancreatic tissue (Fig. 6). At operation, "The diverticulum was felt but no definite intradiverticular mass could be noted. The diverticulum took off from the medial aspect of the second portion of the duodenum and lay anterior to and within the substance of the pancreas. Some fragments of pancreatic tissue were so closely applied to the diverticular wall as to account for the appearance of an intradiverticular mass. With pressure on the anterior abdominal wall and barium in the diverticulum the pancreatic tissue could appear as a mass within the diverticulum. As the diverticulum was mobilized a tiny accessory duct was found in the uppermost portion coming from the pancreas. The diverticulum was amputated at its neck in a transverse fashion."[9]

Comment

The patient has been free from symptoms during the year since her operation. The time, location, and radiation of the pain are quite typical of

Fig. 6. (*left*) Case 3. Duodenal diverticulum with a large filling defect resembling a tumor. The mucosal folds can be identified at the base of the diverticulum. **Fig. 7.** (*right*) Case 4. The duodenal pouch is lateral while its pedicle is attached to the medial surface. Note that the duodenal loop is not widened. (Inoperable carcinoma of the pancreas.)

pancreatic irritation, which in this case was probably incident to intermittent obstruction of the pancreatic duct.

Case 4

A man aged 77 complained of pain in the right upper quadrant. He thought that occasionally his skin was yellow. He had had these symptoms for about 1 year, but they had become worse in the last month. X-ray examination showed a diverticulum of the descending duodenum. The pouch was on the lateral aspect of the duodenum, but its pedicle was attached to the medial surface (Fig. 7). Eversion of a duodenal diverticulum has been described as a sign of carcinoma of the head of the pancreas (Ochsner's sign).[10] At operation the gallbladder was greatly distended. The common duct was dilated to 2.5 cm. The pancreas was markedly invaded by tumor. A palliative choledochoduodenostomy was performed.

Comment

The point of attachment of a duodenal diverticulum is of clinical importance. There is an erroneous implication in the statement ". . . that although the sac of the diverticulum is located laterally, the neck in those cases almost always arises medially."[11] Duodenal diverticula do not swing freely about in the abdomen, so that a lateral pouch which has a pedicle that arises from the medial surface must be viewed with suspicion as an ominous sign. It is interesting and important to note that in this case, the duodenal loop was not widened.

DISCUSSION

Most duodenal diverticula are discovered during X-ray examination. While they are usually regarded as interesting anatomic "accidents" it is important to appreciate their possible involvement in a symptom complex, the most significant being bleeding from the alimentary tract and pain, the latter often having a food relationship typical of duodenal ulcer. Periumbilical or right-upper-quadrant pain which radiates straight through to the back is suggestive of pancreatitis. This is even more significant if the pain is worse in the recumbent position.

The location of a duodenal diverticulum may also have clinical significance and it is therefore important to trace its pedicle to the point of origin. Lateral diverticula are usually fixed by abnormal, congenital peritoneal attachments. The more common medial diverticulum is usually adherent to or embedded in the pancreas. The mucosal folds of a true diverticulum can usually be demonstrated. This serves to differentiate it from a pseudodiverticulum formed by walled-off perforations.

SUMMARY

Diverticula of the duodenum are found in about 2% of the population. They are most commonly located on the medial surface of the descending duodenum. A diverticulum may produce symptoms when it retains food or other foreign bodies. It may contain functioning aberrant glandular tissue and be the site of ulceration, perforation, or gangrene. These possibilities must be carefully considered in the examination of a patient who has a duodenal diverticulum and gastrointestinal symptoms which are not otherwise explained.

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