Duodenal Mucosa and Duodenal Structures

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The mucosa of the widened first portion of the duodenum, also known as the bulbus duodeni (duodenal bulb; see Chapter 32), is flat and smooth, in contrast to the more distal duodenal part, which displays the mucosal Kerckring folds, as does the entire small intestine (Fig. 34-1). These circular folds (plicae), which augment the absorption surface of the intestine, begin in the region of the first flexure and increase in number and elevation in the more distal parts of the duodenum. Kerckring folds do not always form complete circles along the entire intestinal wall; some are semicircular, and others branch out to connect with adjacent folds. Both the mucosa and the submucosa participate in the structure of these plicae, whereas all the other layers of the small intestine, including its two muscular coats, are flat and smooth.

Approximately halfway down the posteromedial aspect of the descending portion of the duodenum, at a distance of 8.5 to 10 cm from the pylorus, is the papilla of Vater. The papilla and its relationship to the local anatomy and the anatomic variations are essential to the investigating endoscopist for interpretation of endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound of the area. Here the common bile duct (ductus choledochus) and the major pancreatic duct, or duct of Wirsung, open into the duodenum. The common bile duct approaches the duodenum within the enfolding hepato-duodenal ligament of the lesser omentum (see Chapter 34) and continues caudally in the groove between the descending portion of the duodenum and the pancreas (see Section VII). In the posteromedial duodenal wall, the terminal part of the ductus choledochus produces a slight but perceptible longitudinal impression known as the plica longitudinalis duodeni. This fold usually ends at the papilla but occasionally may continue for a short distance beyond the papilla in the form of the so-called frenulum. Small, hoodlike folds at the top of the papilla protect the mouth of the combined bile duct and pancreatic duct.

Numerous variations occur in the types of union of the bile and pancreatic ducts, as illustrated and discussed in Section VII. A small, wartlike, and generally less distinct second papilla, the papilla duodeni minor, is situated approximately 2.5 cm above, and slightly farther medially from, the major papilla. It serves as an opening for the minor pancreatic duct, or duct of Santorini, which is almost always present, despite great variations in development (see also Section VIII).

Except for the first portion of the duodenum, the mucosal surface, which is red in living patients, is lined with villi (see Section IV); these account for its typical velvetlike appearance. The high magnification of videoendoscopes enables endoscopists to determine when villi are flattened. A biopsy specimen is still needed to be certain of villous atrophy.

The duodenal bulb, varying in form, size, position, and orientation, appears in the anteroposterior radiographic projection as a triangle, with its base at the pylorus and its tip pointing toward the inferior angle or the transitional region of the first and second parts of the duodenum. As with the wall of the whole intestinal tract, the wall of the duodenum comprises one mucosal, one submucosal, and two muscular layers and an adventitia, or a subserosa and a serosa, wherever the duodenum is covered by peritoneum. Embryologically, morphologically, and functionally, the duodenum is an especially differentiated part of the small intestine. The epithelium of the duodenal mucosa consists of a single layer of high columnar cells with a marked cuticular border. In the fundus of the crypts, there are cells filled with eosinophilic granules (cells of Paneth) and some cells filled with yellow granules, which have a strong affinity to chromates. The tunica or lamina propria of the mucosa consists of loose connective tissue. Between the mucosa and the submucosa lies a double layer of smooth muscle cells, the fibers of which enter the tunica propria and continue to the tips of villi, enabling the villi to perform a sucking and pumping function.

The submucosa, lying between the mucosal and the muscular layers, allows these two layers to shift in relation to each other. It is made up of collagenous connective tissue, the fibers of which are arranged in the form of a mesh. In this network are embedded the duodenal glands of Brunner, characteristic of the duodenum. These are tortuous, acinotubular glands with multiple branches at their ends; breaking through the muscularis mucosae, they open into the crypts. Brunner glands are more numerous and denser in the proximal parts of the duodenum, diminishing in size and density as the duodenum approaches the duodeno-jejunal junction, although their extension and density vary greatly among individuals.

ADDITIONAL RESOURCES


Figure 34-1  Duodenal Bulb and the Mucosal Surface of the Duodenum.