

18 Pancreas

The pancreas can intimidate even the most experienced pathologist. The complexity of the anatomy of the pancreas and the importance of a good dissection in establishing the correct diagnosis make the arrival of a resected pancreas in the surgical pathology laboratory a particularly stressful event. This stress can, however, be greatly reduced if you familiarize yourself with a few basic aspects of the anatomy of the pancreas, and if you take a simple, logical approach to your dissection.

Pancreaticoduodenectomies

The Whipple procedure (pancreaticoduodenectomy) has emerged as an effective and safe treatment for neoplasms of the head of the pancreas, duodenum, distal common bile duct, and ampulla of Vater. The orientation of these specimens can be greatly simplified if you remember that the specimen is composed of four basic components: (1) the duodenum, (2) the ampulla of Vater, (3) the bile duct, and (4) the pancreas.

Begin by orienting the duodenum: Two features of the duodenum can be used to identify its proximal and distal ends. First, the free proximal end is almost always shorter than the free distal segment of the resected duodenum. Second, a small part of the stomach is occasionally attached to the proximal end. Next, identify the bile duct. As illustrated, the common bile duct can be recognized by its greenish color and characteristic tubular appearance. Also, if the gallbladder is present, use the insertion of the cystic duct to identify the common bile duct. The remaining components of the pancreas can

be identified using the duodenum and bile duct as guides. The pancreas itself sits at the base of the junction of the bile duct and duodenum. The head of the pancreas sits within the duodenal C loop. The pancreatic neck margin can be recognized as the cut oval pancreatic surface with a central duct. Although the uncinata process of the pancreas is more difficult to identify, it can be visualized if you keep the anatomy of the pancreas in mind. As illustrated, the pancreas sits like a slightly curled hand enveloping the superior mesenteric artery and the portal vein. The thumb of the curled hand corresponds to the uncinata process of the pancreas and the flat fingers to the neck, body, and tail. Although the superior mesenteric vessels are not present in the resected specimen, remember that they were dissected from the pancreas right at the groove between the thumb and index finger.

After the major external landmarks have been identified, measure the dimensions of each, and ink the surface of the pancreas and the proximal and distal duodenal margins. Begin the dissection by opening the duodenum along the side opposite the pancreas. Look for and document any duodenal masses, ulcers, or areas of puckering of the duodenal mucosa. Before cutting the specimen any further, submit sections of the margins. These should include: (1) a shave section of the bile duct margin; (2) a shave section of the pancreatic neck margin; (3) a perpendicular section of the uncinata margin taken to include the vascular groove; (4) a perpendicular section from the proximal duodenal margin; and (5) a shave section from the distal duodenal margin. Next, using a pair of scissors, open the common bile duct. Because the extrapancreatic (proximal) portion of the duct is usually dilated, you may find it easier

to start the incision at the proximal end. Extend the incision longitudinally down through the ampulla of Vater, and note any strictures or exophytic masses in the bile duct and in the ampulla of Vater. Similarly, if the gallbladder is present, open it from its dome through the cystic duct to the point where it opens into the common bile duct. Note any calculi, strictures, or masses, and take a representative section of the gallbladder for histology (see Chapter 17).

After the duodenum and bile duct have been opened, you can now section the pancreas. This can be accomplished in a variety of ways, but we like to bread-loaf it into 2-mm slices perpendicular to the long axis of the duodenum. Use a long sharp knife to cut through the pancreas, leaving each slice attached to the specimen at the duodenum.

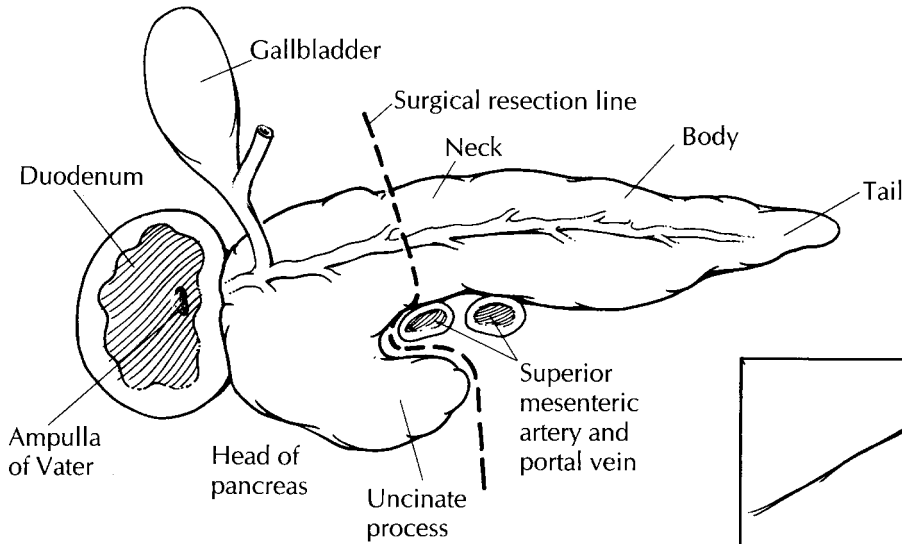
Now that the various components of the specimen have been exposed, there are five questions to answer: First, is a neoplasm present? Most of the cancers will be obvious, but if you have trouble finding the tumor, look carefully at the bile duct and pancreatic parenchyma. Often, the bile duct is strictured at the level of the tumor, and tumors involving the pancreas usually disrupt the gland's normal lobular architecture. Second, if a tumor is present, where is it located, and what is its probable site of origin (pancreas, bile duct, ampulla of Vater, or duodenum)? Third, what is the size of the tumor (measured in centimeters)? Fourth, what is the gross appearance of the neoplasm (solid or cystic)? Finally, how many lymph nodes are present, and are the lymph nodes grossly abnormal? The answers to each of these five questions will help identify and stage the neoplasm, and each answer should be carefully documented in the gross description. At this point, you may wish to fix the specimen overnight in formalin.

After the specimen has been well fixed, carefully paint the mucosa of the common bile duct with orange ink or tattoo powder. This simple step will help in the interpretation of microscopic slides, because without the paint in the bile duct, it can be almost impossible to distinguish the bile duct from the pancreatic duct microscopically. Next, submit sections for histology. The sections will flow naturally if you remember the four basic components of the specimen (the pancreas, duodenum, bile duct, and ampulla). Submit sections of the pancreatic parenchyma, the bile duct, the duodenum, the ampulla, and representative sec-

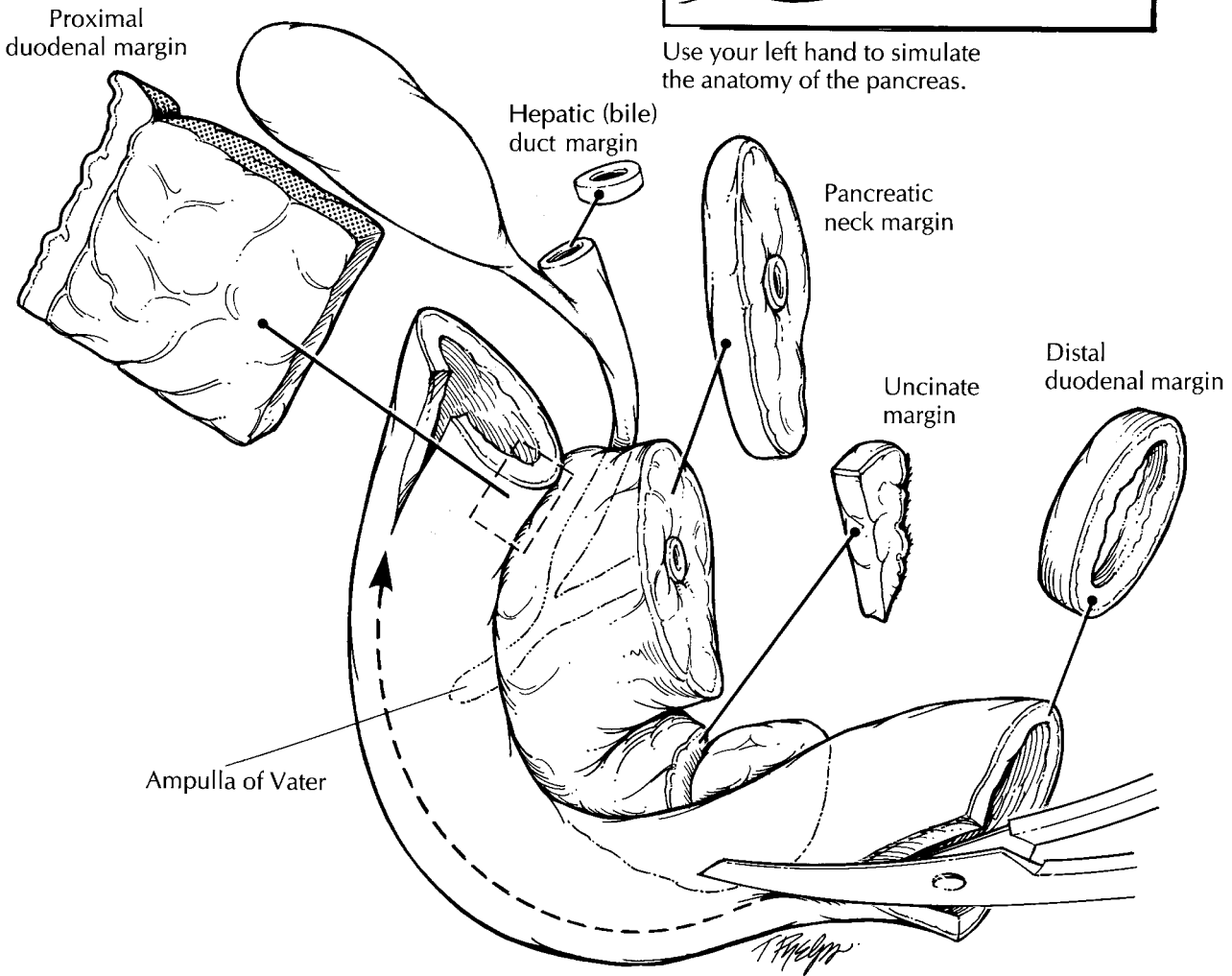
tions of all masses. Submit one section of pancreatic parenchyma for each 1 cm of maximum pancreatic length. As illustrated, a section that we find particularly helpful is a section parallel to the long axis of the bile duct that includes the duodenum, ampulla, bile duct, and pancreas all in one. If a mass is present, be sure to include sections that demonstrate the relationship of the mass to each of the four components of the specimen and sections that demonstrate the relationship of the neoplasm to the anterior and posterior soft tissue margins. Next, submit a representative section of each lymph node. Although the lymphatic drainage of the pancreas is complex, we have not found detailed accounts of the exact location of each lymph node submitted to be helpful. Instead, we prefer to spend time making sure that we find all of the nodes. A good place to look for nodes is in the peripancreatic fat at the junction of the pancreas and duodenum. They may also be found in the mesentery and around the bile duct.

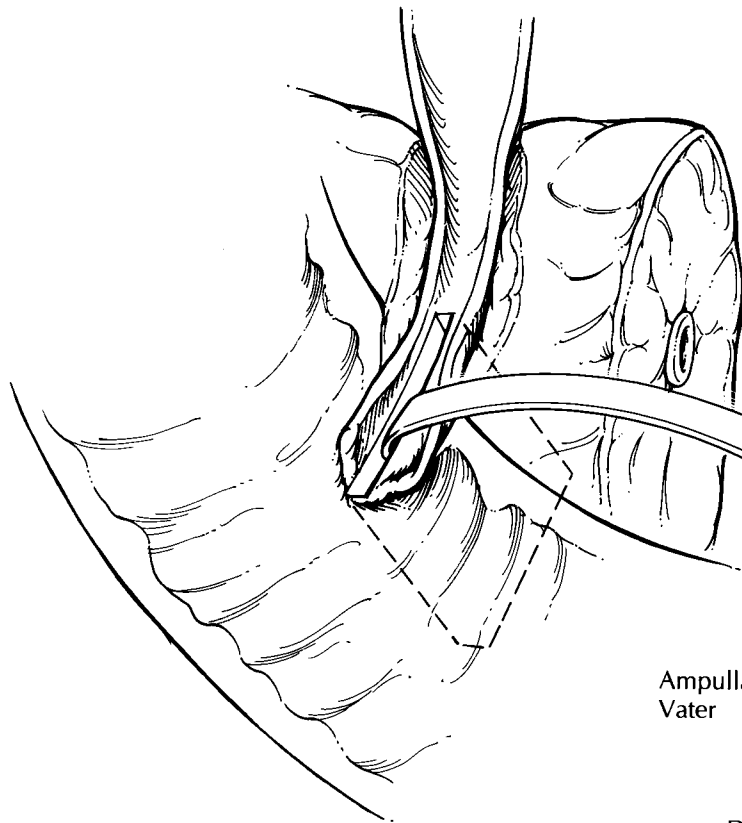
Distal Pancreatectomies

Distal pancreatectomies are much easier to handle than are pancreaticoduodenectomies. The anatomy is simple, and there are fewer margins to sample. First, find the proximal and distal ends of the pancreas. The spleen helps identify the distal aspect of the gland, and the cut surface of the pancreas is the proximal end. Next, weigh and measure the specimen, and submit a shave section of the proximal pancreatic margin. Ink the surface of the gland, and then bread-loaf it into 2-mm slices using a long sharp knife. These slices should be made perpendicular to the long axis of the gland. Examine the pancreatic parenchyma carefully, paying particular attention to the pancreatic duct. Is the duct dilated or stenotic? Are there any masses or calculi in it? What is the consistency of any fluid in the duct? Note the size, location, and gross appearance of any masses. Submit representative sections of any tumors and of the pancreatic parenchyma. Examine the peripancreatic soft tissues for lymph nodes, note their gross appearance, and submit a representative section of each. If the spleen is present, weigh it, measure it, section it, and submit representative sections, as described in the discussion of the spleen (see Chapter 42).

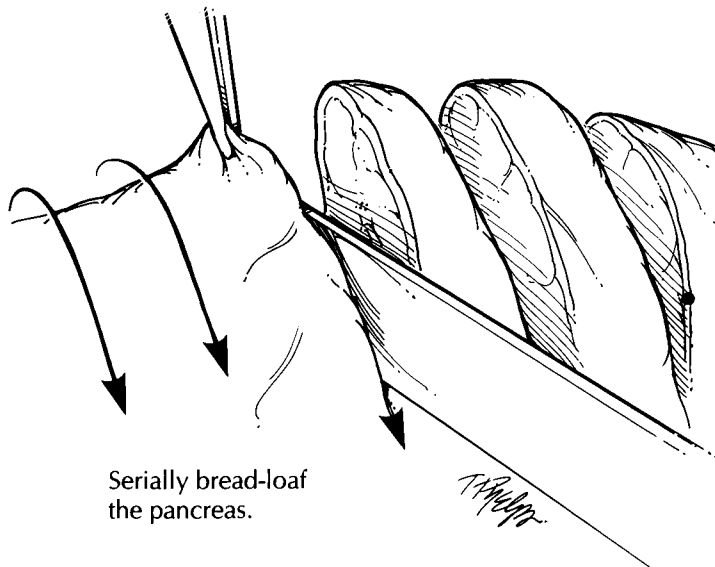
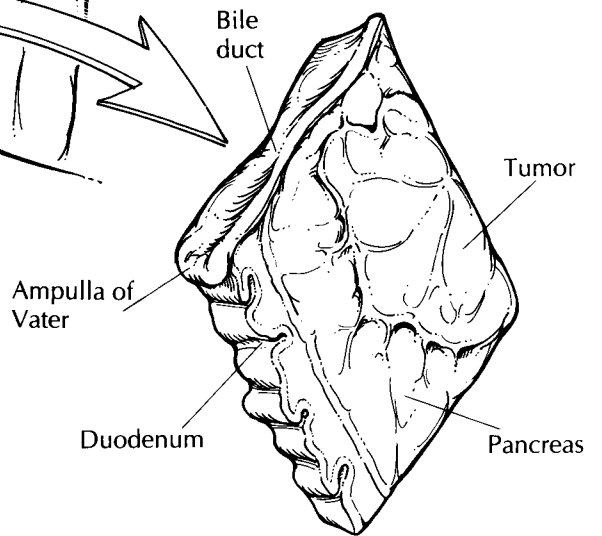


Use your left hand to simulate the anatomy of the pancreas.





Single section demonstrating the ampulla of Vater, duodenum, bile duct, and pancreas



Serially bread-loaf the pancreas.

Pancreaticoduodenectomy

1. Remember the four basic components of the specimen: the duodenum, the ampulla of Vater, the bile duct, and the pancreas.
2. Orient the specimen. The distal portion of the duodenum is usually longer than the proximal portion.
3. Shave the distal duodenal, bile duct, and pancreatic neck margins. Take perpendicular sections of the proximal duodenal and uncinata margins.
4. Open the duodenum on the side opposite the pancreas. Open the bile duct, and paint it with orange tattoo powder or orange ink.
5. Section the pancreas at 2-mm intervals.
6. Submit the five margin sections and sections of the tumor, the pancreatic parenchyma, the bile duct, the duodenum, the ampulla of Vater, and each lymph node.

Like the pancreaticoduodenectomy specimen, your final report should document the presence or absence of a neoplasm; the type, grade, and size of the tumor; the status of the margins; any lymph node metastases; and the presence or absence of vascular, perineural, and soft tissue invasion.

Cystic Tumors

Cystic masses in the pancreas should be handled as described above. In addition, remember to do the following: (1) Describe the character of the cyst contents. Is the fluid clear or cloudy? Is it serous, mucinous, necrotic or bloody? A good description of the cyst contents can be invaluable in determining the tumor type. (2) Document whether the cyst is unilocular or multilocular. How large are the cysts, and are there any mural nodules? (3) If the cyst is lined by mucinous epithelium, then the entire cyst should be submitted for histologic diagnosis. Keep in mind that otherwise benign-appearing mucinous cystic neoplasms can harbor small invasive cancers. (4) Finally and importantly, document the relationship of the cyst to the pancreatic ducts. This can be important because intraductal papillary mucinous neoplasms, by definition, involve the duct system, whereas mucinous cystic neoplasms usually do not.

Ampullectomy

The ampulla of Vater is formed by the confluence of the pancreatic and distal common bile ducts as they pass through the wall of the duodenum and open into the duodenal lumen. Small neoplasms of the ampulla of Vater are occasionally resected in a procedure known as an ampullectomy. In these instances the specimen usually consists of a small disk of duodenal tissue about the size of a quarter. The underside of the disk is composed of transected sections of the pancreatic and bile ducts, the disk itself is traversed by the

ducts, and the upper surface is lined by duodenal mucosa, in the center of which is the papilla of Vater.

Identify the bile and pancreatic ducts and submit a shave section of each duct margin. Next, ink the edges of the disk (the duodenal margins) and the aspects of the deep margin not sampled when the duct margins were taken. Then simply bread-loaf the specimen in 2-mm slices along the axis that best demonstrates the relationship between the tumor and the duodenal margin it most closely approaches. Document the gross appearance (e.g., papillary, endophytic), size, and location of any masses; then submit the entire specimen for histologic evaluation.

Important Issues to Address in Your Surgical Pathology Report on Pancreatic Resections

- What procedure was performed, and what structures/organs are present?
- Is a neoplasm present?
- What is the probable site of origin of the tumor (bile duct, pancreas, ampulla of Vater, or duodenum)?
- What is the size of the tumor (in centimeters)?
- What are the histologic type and grade of the neoplasm? Is an *in situ* component identified?
- Does the tumor extend into the peripancreatic soft tissues? If so, does it extend anteriorly or posteriorly?
- Does the tumor infiltrate blood vessels, lymphatics, or nerves? Does the tumor extend into the pancreas, duodenum, ampulla of Vater, common bile duct, or spleen?
- Does the tumor involve any of the margins (pancreatic neck, uncinate, bile duct, soft tissue, and proximal and distal duodenal)?
- Does the tumor involve regional lymph nodes? Include the number of nodes examined and the number of nodes involved.
- Do the non-neoplastic portions of the pancreas and duodenum show any pathology?