

17 Gallbladder and Extrahepatic Biliary System

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The biliary system forms a conduit whereby bile produced by hepatocytes is transmitted to and concentrated in the gallbladder and finally excreted into the duodenum. Bile is first secreted into bile canaliculi, which form the smallest branches of the biliary system. Canaliculi drain into interlobular bile ducts, which join to form progressively larger intrahepatic ducts until the left and right hepatic ducts emerge from the liver in the region of the porta hepatis. Slightly distal to the porta hepatis, the left and right hepatic ducts join to form the common hepatic duct. The common hepatic duct is then joined on its right side by the cystic duct of the gallbladder to form the common bile duct. The distal common bile duct usually joins with the pancreatic duct within the head of the pancreas and empties into the duodenum at the ampulla of Vater. The exact anatomy and lengths of the various extrahepatic ducts vary among individuals. The common hepatic duct ranges from 1 to 5 cm in length, the cystic duct from 2 to 6 cm, and the common bile duct from 5 to 10 cm. The usual diameter is 4 to 5 mm for the cystic duct and 5 to 7 mm for the common bile duct.

Cholecystectomies

The gallbladder is one of the more frequently encountered specimens in the surgical pathology laboratory. It is usually removed for stones and/or an inflammatory condition, but it rarely does harbor a neoplasm.

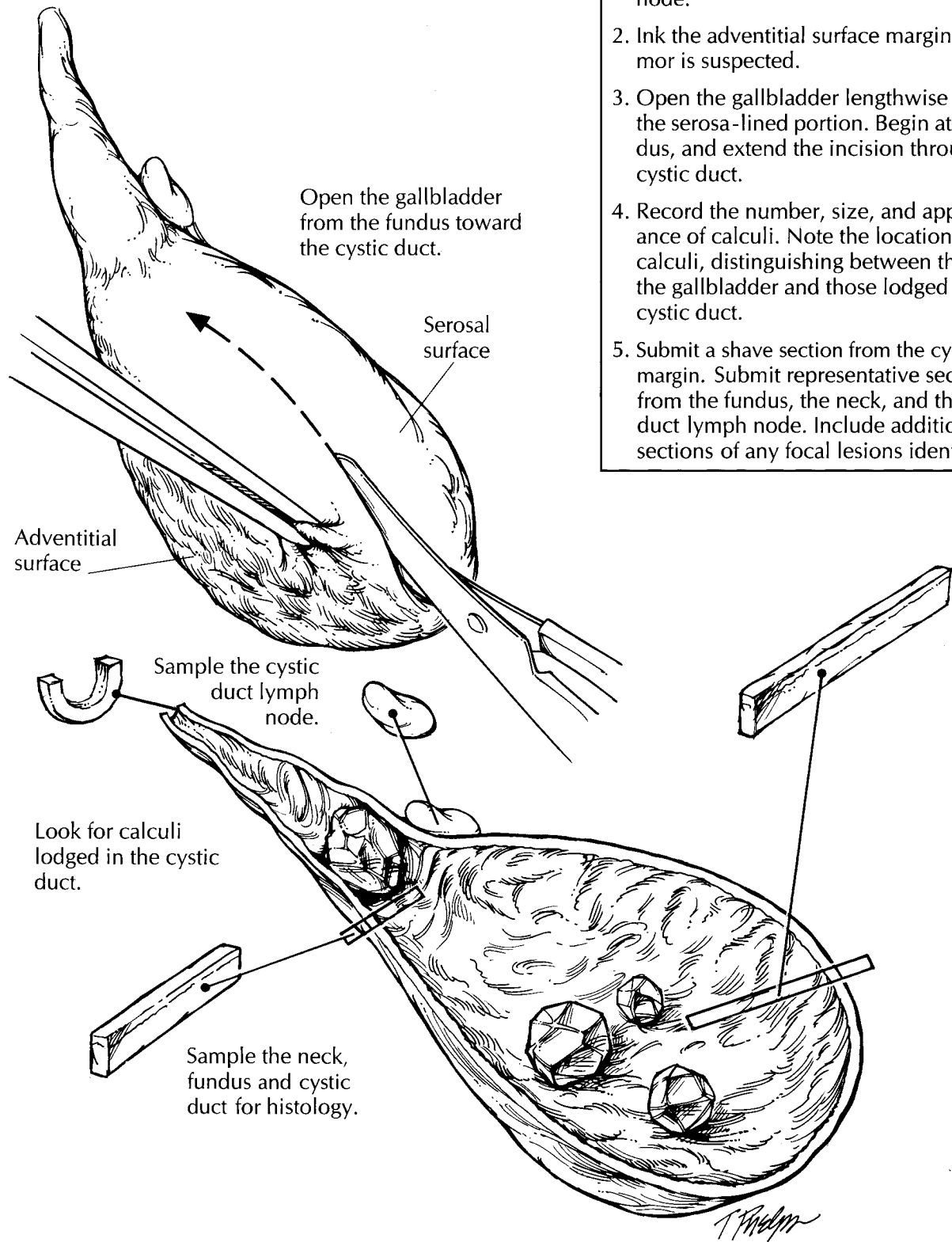
The gallbladder is a saccular structure composed of a fundus, body, and neck. It progressively narrows to form the cystic duct. Even though this structural anatomy is straightfor-

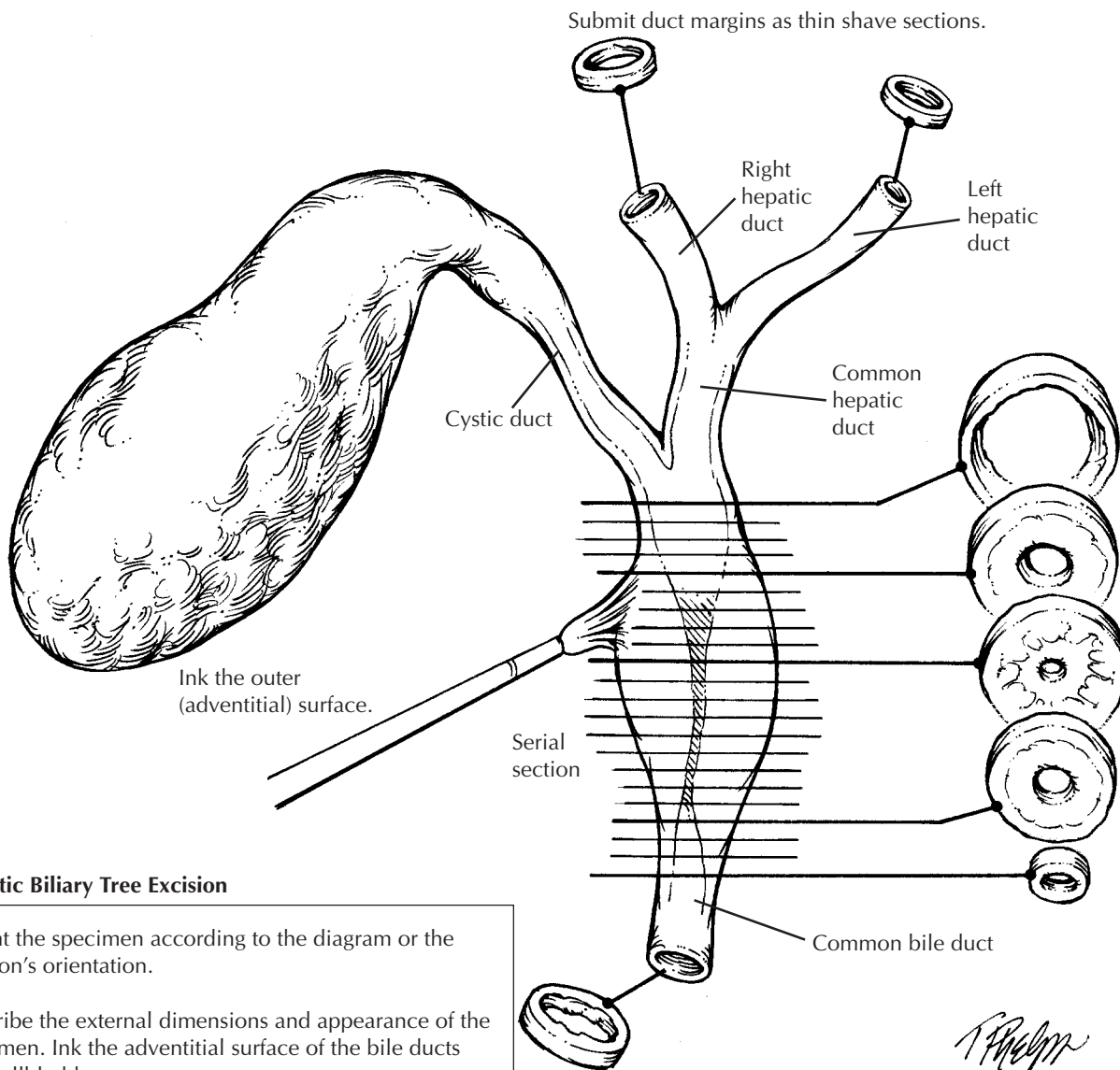
ward, take a moment to orient the specimen and identify a few important features. First, note that the usual gallbladder has two very different external surfaces. One side of the gallbladder is smooth and glistening, whereas the other is rough. The distinction between these two surfaces is important. The smooth surface is lined by peritoneum. In contrast, the rough surface is where the adventitia of the gallbladder has been dissected from the undersurface of the liver, and it represents a surgical margin. (Rarely, a gallbladder is entirely buried within the liver parenchyma or is attached to the liver only by a mesentery.) Second, the lymphatics of the gallbladder drain into a lymph node located along the cystic duct. When present in the specimen, this cystic duct lymph node can be identified by palpating the soft tissues investing the cystic duct.

State whether the gallbladder is received fresh or in fixative. Measure the specimen, and describe the external surfaces. One important issue to address at the onset of the dissection is whether the specimen is received intact. Not uncommonly, a gallbladder is opened in the operating room and the stones removed. Receipt of a previously opened gallbladder should be documented in the gross description. If the specimen is still intact, open the gallbladder lengthwise through its serosa-lined surface. Using a small pair of scissors, begin at the fundus; next, extend the cut through the body and neck of the gallbladder and then through the cystic duct. The lumen of the cystic duct should be examined, even though the duct may be tortuous and difficult to open. The direction in which the gallbladder is opened is important. Do not begin at the opening of the cystic duct because a probe or scissors forced into this opening could dislodge stones.

Cholecystectomy

1. Orient the gallbladder. Distinguish the serosal surface from the adventitial surface. If present, locate the cystic duct lymph node.
2. Ink the adventitial surface margin if a tumor is suspected.
3. Open the gallbladder lengthwise through the serosa-lined portion. Begin at the fundus, and extend the incision through the cystic duct.
4. Record the number, size, and appearance of calculi. Note the location of any calculi, distinguishing between those in the gallbladder and those lodged in the cystic duct.
5. Submit a shave section from the cystic duct margin. Submit representative sections from the fundus, the neck, and the cystic duct lymph node. Include additional sections of any focal lesions identified.





Extrahepatic Biliary Tree Excision

1. Orient the specimen according to the diagram or the surgeon's orientation.
2. Describe the external dimensions and appearance of the specimen. Ink the adventitial surface of the bile ducts and gallbladder.
3. Serially section the bile ducts. Describe any focal abnormalities of the wall and/or lumen.
4. Sample each duct margin (i.e., left hepatic duct, right hepatic duct, common bile duct) as a thin shave section.
5. Entirely submit the bile ducts for histologic examination. Carefully label each duct margin, and separately submit each margin in its own labeled tissue cassette.
6. If the gallbladder is included, submit routine sections including sections of the adventitial margin and the cystic duct lymph node.

Submit each duct margin in its own separately labeled cassette.

After the specimen has been opened, note the contents of the gallbladder and the cystic duct. Is the usual thin, dark green bile present; or is it hemorrhagic, viscous, or sludgy? Is the lumen filled with pus (an infected gallbladder) or replaced by clear white mucoid material (mucocele)? Look for calculi, and determine whether they are present within the lumen of the gallbladder or within the cystic duct. Record the appearance of any calculi. Are they round or faceted? What is their color? Use a sharp blade to cut the calculi in half, and note the appearance of their cut surfaces. How many calculi are present? When numerous calculi are present, there is a tendency to record the size of the largest one. Instead, record the full range of sizes, keeping in mind that the smaller calculi are more apt to become lodged in the cystic duct than are the larger ones.

Next, measure the thickness of the gallbladder wall, and describe the appearance of the mucosa. The mucosa is normally bile-stained and has a fine, honeycombed appearance. A frequent mucosal abnormality is cholesterosis, in which there are numerous yellow punctate deposits or interlacing linear yellow streaks on the mucosa ("strawberry gallbladder"). If a neoplasm is suggested by the presence of an exophytic or ulcerative lesion, the external adventitial surface should be inked, as it represents an important surgical margin. Describe the location of the neoplasm, its dimensions, and its configuration (e.g., exophytic, ulcerating, diffusely infiltrating with associated wall thickening). If liver parenchyma is attached to the adventitial surface of the gallbladder, does the tumor appear to invade the liver?

The gallbladder is best sampled after it has been allowed to fix. For routine specimens, submit one representative full-thickness section from the fundus, one through the body/neck of the gallbladder, and one cross section of the cystic duct margin. Additional sections are required when focal lesions are present. If a neoplastic process is suspected, obtain full-thickness sections of the tumor to demonstrate its maximum depth of invasion. Also submit sections from the periphery of the tumor to demonstrate its relationship to the surrounding uninvolved mucosa. To assess the status of the margins when a neoplasm is suspected, submit a shave section from the cystic duct margin and perpendicular sections from the inked adventitial surface. When

present, the cystic duct lymph node should always be submitted for histologic evaluation.

Local or Segmental Biliary Resections

The extrahepatic bile ducts are most commonly encountered as part of a pancreaticoduodenectomy (including the distal common bile duct) and partial or total hepatectomy (including portions of the proximal extrahepatic biliary tree). Examination of the bile ducts in these specimens is described elsewhere in this book. Local or segmental resections of the extrahepatic bile ducts are less common but may be performed for carcinoma of the extrahepatic bile ducts, isolated strictures, or choledochal cysts.

The specimen should first be oriented, preferably as indicated by the surgeon or by noting its relationship to the gallbladder. Note if the specimen is received fixed or unfixed, whether it has been previously incised, and whether other tissues or organs accompany the bile duct. Measure the length and diameter of each portion of the biliary tree that is present. Describe the appearance of the external surface, including the presence of any mass lesions or adhesions. In general, the proximal and distal bile duct margins and the periductal soft tissue (forming the circumferential margin of the excision) should then be inked because of the high likelihood of carcinoma.

It is best not to attempt to open the ducts longitudinally, since small papillary lesions in the ducts could easily be dislodged and the mucosa disrupted by the scissors. Instead, make serial cross sections at 2- to 3-mm intervals with a scalpel, keeping the cross sections oriented with regard to the segment of the biliary tree and the proximal and distal margins. The resulting cross sections can then be examined for the presence of any obstructing lesions in the lumen, the presence of a mass, or the presence of a stricture. If a stricture is present, describe its location and measure its length, the sizes of the bile duct lumen at, above, and below the stricture, and the thickness of the bile duct wall in the region of the stricture and elsewhere. Carcinoma of the bile ducts can infiltrate diffusely into the bile duct wall and thereby mimic a benign stricture, or it can have a papillary or nodular configuration. If a calculus,

papillary lesion, or mass is seen, describe its location, whether it obstructs the lumen, and whether there is obvious penetration of the bile duct wall and involvement of any adjacent structures. In general, the specimen should then be submitted in its entirety in serial cross sections, keeping the proximal and distal shave margins separate. (Surgically resectable carcinomas of the bile ducts are unlikely to be too large to submit in toto, and segmental bile duct resections without a grossly obvious tumor would have to be completely embedded anyway.)

Choledochal cysts should also be inked along the external surface. Measure the dimensions of the cyst and describe its configuration (e.g., fusiform or saccular). Carefully incise the cyst with a scalpel and drain the contents into a container. Note the volume and type of the fluid present (bile, blood, fibrin, mucoid material, pus). After draining the cyst contents, open the cyst longitudinally with a small pair of scissors and examine the inner lining. Specifically, describe the appearance of the lining (often denuded, bile-stained, and shaggy) and the presence of any visible islands of residual mucosa. Are any masses or suspicious lesions present? The risk of carcinoma developing within choledochal cysts increases with age, and up to 15% of choledochal cysts in adults harbor a carcinoma. If a suspicious lesion is present, describe its dimensions, color, consistency, associated necrosis, and how deeply it penetrates the cyst wall.

Representative full-thickness sections of the cyst should be taken. They should include approximately one section per centimeter of cyst wall diameter as well as proximal and distal shave margins. If any suspicious lesions are present, additional sections are needed, including full-thickness sections of the lesion at its deepest extent and sections that demonstrate the interface between the lesion and the adjacent cyst wall.

Important Issues to Address in Your Surgical Pathology Report

- What procedure was performed, and what structures/organs are present?
- What are the contents of the gallbladder, bile duct, or choledochal cyst (e.g., bile, pus, blood, mucus)? When calculi are present, note their type (pigment, cholesterol, mixed), number, and the range of sizes. Are any calculi lodged in the cystic duct or present in a bile duct?
- What are the nature and severity of the inflammatory processes (e.g., acute or chronic cholecystitis, xanthogranulomatous cholecystitis, primary or secondary sclerosing cholangitis)? For a cholecystectomy, be sure to mention the presence or absence of perforations and peritonitis.
- Is a neoplasm present? What are its location, size, histologic type, histologic grade, and depth of invasion (mucosa, gallbladder muscularis or bile duct fibromuscular layer, perimuscular or periductal soft tissue)? Is there angiolymphatic invasion or perineural invasion? Does the tumor extend into adjacent organs? For gallbladder carcinomas, it is important to note whether there is invasion into the liver, and whether this invasion is more than 2 cm. Are the adventitial/hepatic bed margin and the cystic duct margin free of tumor? For bile duct carcinomas, are the periductal soft tissue margin and the proximal and distal bile duct margins free of tumor?
- Are there preneoplastic changes in the surrounding mucosa (intestinal metaplasia, dysplasia)?
- How many lymph nodes were examined, and how many of them harbored a metastasis?