Chapter 13
Imaging of Pancreatic Adenocarcinoma

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Imaging plays a crucial role in the diagnosis, staging, and follow-up of pancreatic adenocarcinoma. In addition to identifying the primary tumor, the goals of imaging in pancreatic cancer include assessment of local and regional invasion, evaluation of lymph nodes and vascular structures, and evaluation for possible metastatic disease. Furthermore, imaging assessment identifies those patients who are candidates for resection—the only known therapy associated with long-term survival—and spares others from unnecessary surgical intervention. There is no indication for plain film evaluation and limited value in using ultrasonography (US) in the evaluation of pancreatic cancer. Because of its invasive nature, angiography has fallen out of favor in the evaluation of pancreatic adenocarcinoma. Cross-sectional imaging, including computed tomography (CT) and MRI, however, meet the stated goals in the assessment of pancreatic cancer. Magnetic resonance cholangiopancreatography (MRCP) can also add valuable information in specific cases. Other important modalities that utilize imaging include EUS, endoscopic retrograde pancreatography (ERCP), and PET are discussed elsewhere in this text.

Ultrasonography (US)

Indication

Sonography is widely available, relatively inexpensive, and noninvasive. It is often used for initial screenings of nonspecific abdominal complaints and evaluation of jaundice. Additional advantages of US include portability, ability to evaluate in real-time and the role it plays in image-guided procedures and intraoperative evaluations. In general, disadvantages of sonography include operator dependence, artifacts—particularly those caused by bowel gas—and limitations caused by patients’ body habitus. Because of the location of the pancreas in the retroperitoneum and bowel, neighboring the head and tail of the pancreas, transabdominal US evaluation is inherently limited. The gastric body is anterior to the tail of the pancreas, while
the duodenal loop surrounds the pancreatic head and jejunal loops and splenic flexure are anterior to the tail of the pancreas. As an initial screening study for nonspecific abdominal complaints, one of the best utilizations of US is in the evaluation of liver metastasis and assessment of the common bile and pancreatic ducts. The use of US intraoperatively—either laparoscopically or during a laparotomy—has been described as an additional tool in the evaluation of tumor respectability (1).

**Technique**

The pancreas is evaluated as part of the general abdominal examination. It is best visualized after a 4- to 6-hour fast. This allows for decreased gaseous distention and for the gallbladder and biliary system to distend. Transverse and sagittal midline views, at a slight oblique angle below the level of the xiphoid, provide the best views of the pancreas transabdominally. A curved array detector with lower frequency is utilized to allow evaluation of deeper structures.

In the 1990’s, laparoscopic US was reported as an effective tool used for assessing resectability with a reported accuracy of 94% (2). Intraoperative sonography has also been used and reported to be useful in the assessment of vascular invasion. In the series by Taylor et al. laparoscopic US prevented unnecessary additional surgery in 53% of their patients. With the new multidetector CT (MDCT) and the use of multiphasic contrast-enhanced protocols, however, the information previously provided by either laparoscopic or intraoperative US is often obsolete.

The use of contrast-enhanced US is also reported in the literature (3) as a labor intensive experimental technique that may prove to be of use in the future for the evaluation of small pancreatic tumors; however, US contrast is not available for use in the United States. Again, the new generation CT scanners are superior, and thinner slice protocols can detect small tumors. In a meta-analysis comparing US, CT, and MRI, Bipat and colleagues estimated a sensitivity of 76% and a specificity of 75% for the sonographic diagnosis of pancreatic cancer and for resectability sensitivity and specificity of 83% and of 63%, respectively (4). Sonography had the lowest sensitivity and specificity as compared to the other modalities evaluated. Even more recent reports of better staging of resectability by intraoperative US over preoperative CT imaging are flawed by the use of conventional CT data (1).

**Findings**

Characteristic findings of pancreatic cancer during sonography are a hypoechoic mass with ill-defined margins. Unfortunately this is indistinguishable from the sonographic appearance of focal pancreatitis. Associated findings include the presence of dilated common bile and pancreatic ducts (the so-called double-duct sign indicating a tumor in the pancreatic head) (see Fig. 13.1), and atrophy of the pancreas. Assessment of lymph node involvement