MR Imaging of Annular Pancreas

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Abstract. The appearance of annular pancreas on magnetic resonance (MR) images is described in a 14-year-old boy with pancreatitis and incomplete pancreas divisum. The presence of the coexisting abnormalities complicated the interpretation of an upper gastrointestinal series and computed tomographic (CT) study. MR imaging was useful as a problem-solving technique to supplement the conventional imaging tests.

Key words: Pancreas, abnormalities—Pancreas, MR and CT diagnosis.

Annular pancreas is a rare but well-known congenital anomaly in which the head of the pancreas totally or partially surrounds the duodenum. The most common clinical manifestation of annular pancreas is duodenal obstruction. Abdominal radiographs may show a "double bubble" sign resulting from dilatation of the duodenum and stomach. A concentric stenotic ring or eccentric lateral defect involving the second portion of the duodenum is often seen on upper gastrointestinal series. Computed tomography (CT) may show pancreatic tissue encircling the second portion of the duodenum [1]. Definitive diagnosis of annular pancreas can be made by demonstration of the pancreatic duct encircling the second portion of the duodenum [1]. Definitive diagnosis of annular pancreas can be made by demonstration of the pancreatic duct encircling the second portion of the duodenum [1]. Definitive diagnosis of annular pancreas can be made by demonstration of the pancreatic duct encircling the second portion of the duodenum [1].

Case Report

A 14-year-old boy was admitted to the hospital with a history of jaundice for 2 weeks and the recent onset of right upper quadrant pain and vomiting. Laboratory evaluation showed marked elevation of the liver function tests and the serum amylase level. An ultrasound examination showed an enlarged hypoechoic pancreas, a common bile duct measuring 9 mm in diameter, and mild intrahepatic biliary dilatation. A CT scan was performed showing an enlarged homogeneous pancreatic head, dilatation of the pancreatic duct, and intrahepatic and extrahepatic biliary dilatation. An area of prominent soft tissue density was noted partially surrounding the second portion of the duodenum that was attributed to duodenal wall thickening or spasm secondary to adjacent pancreatic inflammation (Fig. 1).

A diagnosis of pancreatitis was made based on the CT scan and serum amylase level. The patient's symptoms subsided after treatment with nasogastric suction and total parenteral nutrition and he was discharged from the hospital after 2 weeks.

One week later, he was readmitted with increasing abdominal pain, nausea, vomiting, and diarrhea. An upper gastrointestinal series performed at this time was inconclusive. ERCP demonstrated an irregular pancreatic duct consistent with pancreatitis and a dilated common bile duct with a smooth focal stricture in the region of the pancreatic head. Pancreas divisum was diagnosed on the basis of cannulation of both major and minor papillae at ERCP. An incomplete pancreas divisum configuration was shown by drainage of contrast from the major papilla during injection of the minor papilla [3].

An MR examination was performed to exclude a mass in the region of the pancreatic head. The MR study showed extrahepatic biliary dilatation and extension of pancreatic tissue partially encircling the second portion of the duodenum [1]. On the basis of these findings and a review of the prior imaging studies, a diagnosis of annular pancreas was made.

The patient was treated with total parenteral nutrition and somatostatin to decrease pancreatic exocrine output. This resulted in normalization of the serum amylase level but no improvement in biliary drainage and no change in the sonographic appearance of the pancreatic head. On the basis of these findings, the prior imaging results, and the lack of clinical improvement, the patient was taken to surgery. At laparotomy, the presence of annular pancreas was confirmed. The common bile duct measured 15 mm in diameter and no passage of contrast material from the distal common bile duct into the pancreatic duct or duodenum could be demonstrated at intraoperative cholangiography. The gallbladder was removed and a hepaticojejunostomy

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Fig. 1. CT scan shows an enlarged homogeneous pancreatic head (P), prominent peripancreatic veins, and infiltration of the anterior para-
renal fat consistent with acute pancreatitis. There is also apparent thickening of the duodenal wall (arrows) that was felt to be secondary to adjacent pancreatic inflammation.

was performed with a Roux-en-Y reconstruction of the small bowel. The postoperative course was without complications.

Discussion

The etiology of annular pancreas is not known but several hypotheses have been proposed. The most popular theory is that the ventral pancreatic bud becomes fixed during embryogenesis, and as the pancreas and duodenum rotate, a band of pancreatic tissue is left encircling the duodenum [4]. Annular pancreas is frequently associated with other congenital defects including Down syndrome, malrotation of the intestine, duodenal atresia and bands, intestinal webs, tracheoesophageal fistulas, imperforate anus, Meckel’s diverticulum, absence of the gallbladder, and various cardiac malformations [5]. Annular pancreas may also be associated with acute or chronic pancreatitis. There is no known association of annular pancreas with pancreas divisum, although their coexistence has been reported [6].

Annular pancreas may be discovered at any age. More than half of all cases are diagnosed during the first year of life because of signs and symptoms of proximal duodenal obstruction. Severe duodenal stenosis is usually apparent within the neonatal period due to intolerance of oral feedings and intractable vomiting, often of bilious material. In children and young adults, the clinical presentation is usually less dramatic and may include epigastric pain, postprandial fullness, and nausea relieved by vomiting.

The radiographic signs of annular pancreas are those of duodenal obstruction. In the neonatal age group, the diagnosis is often suggested on abdominal radiographs.

Typically, further radiographic studies are unnecessary because surgical treatment is required at which time a definitive diagnosis can be made. In older children and adults it is usually necessary to document duodenal obstruction with an upper gastrointestinal series. This examination verifies the site of duodenal obstruction but often cannot differentiate among its various causes. The diagnosis may be supported by characteristic findings on CT scanning and confirmed at ERCP if necessary.