

# Annular pancreas in an adult patient: diagnosis with endoscopic ultrasonography and magnetic resonance cholangiopancreatography

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## ABSTRACT

**Annular pancreas is an uncommon congenital anomaly that usually presents early in childhood. The role of endoscopic ultrasonography in the diagnosis of this condition has been only sparsely reported. We present annular pancreas in a 50-year-old man; the anomaly was initially suspected during endoscopy and endoscopic ultrasonography, and subsequently confirmed on magnetic resonance cholangiopancreatography.**

**Keywords: annular pancreas, endoscopic ultrasonography, magnetic resonance cholangiopancreatography, pancreatic anomaly**

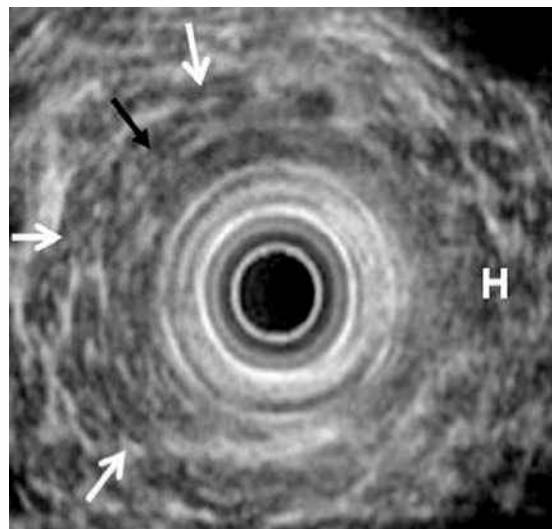
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## INTRODUCTION

Annular pancreas is a rare congenital anomaly in which a portion of the pancreatic tissue surrounds the duodenum. Imaging modalities, including radiograph of the abdomen, barium meal study and, more recently, computed tomography (CT), magnetic resonance (MR) imaging and MR cholangiopancreatography (MRCP), have all assisted in the preoperative diagnosis. The role of endoscopic ultrasonography (EUS), however, has received little attention.<sup>(1)</sup> We present a case of incidentally-detected annular pancreas in an adult patient. EUS and MRCP features are highlighted.

## CASE REPORT

A 50-year-old man presented with epigastric pain of one month duration. There was no associated vomiting or abdominal distension. He had no significant past illness. Physical examination was unremarkable. Standard biochemistry, serum biochemical parameters and abdominal ultrasonography were normal. An upper gastrointestinal endoscopy showed an extrinsic impression on the second part of the duodenum, the cause of which was further evaluated with EUS. EUS revealed a band-like structure, isoechoic and continuous with the head of the pancreas, encircling



**Fig. 1** Radial EUS image from the second part of the duodenum. The pancreatic tissue (white arrows) along with its duct (black arrow) are seen to completely encircle the lumen of the duodenum. H: head of the pancreas.

the descending duodenum (Fig. 1). The pancreatic duct was seen coursing through this tissue around the duodenum. EUS features raised a suspicion of annular pancreas. The findings were subsequently corroborated on MR imaging, which revealed a near complete ring of pancreatic tissue encircling the duodenum (Fig. 2a & b), suggesting the presence of annular pancreas. The encircling annular duct and its opening into the main pancreatic duct were clearly seen on the MRCP images (Fig. 2c). The patient's symptoms resolved with conservative management.

## DISCUSSION

Annular pancreas is an uncommon congenital anomaly (one in 20,000 live births) in which the pancreatic tissue forms a complete (25%) or partial (75%) ring around the descending duodenum.<sup>(1)</sup> Several hypotheses regarding its development have been proposed,<sup>(2)</sup> although the exact aetiology is still unknown. According to the most current theory, the tip of the left ventral anlage adheres to the duodenum and stretches to form a ring during development.<sup>(3)</sup> Histologically, the annular

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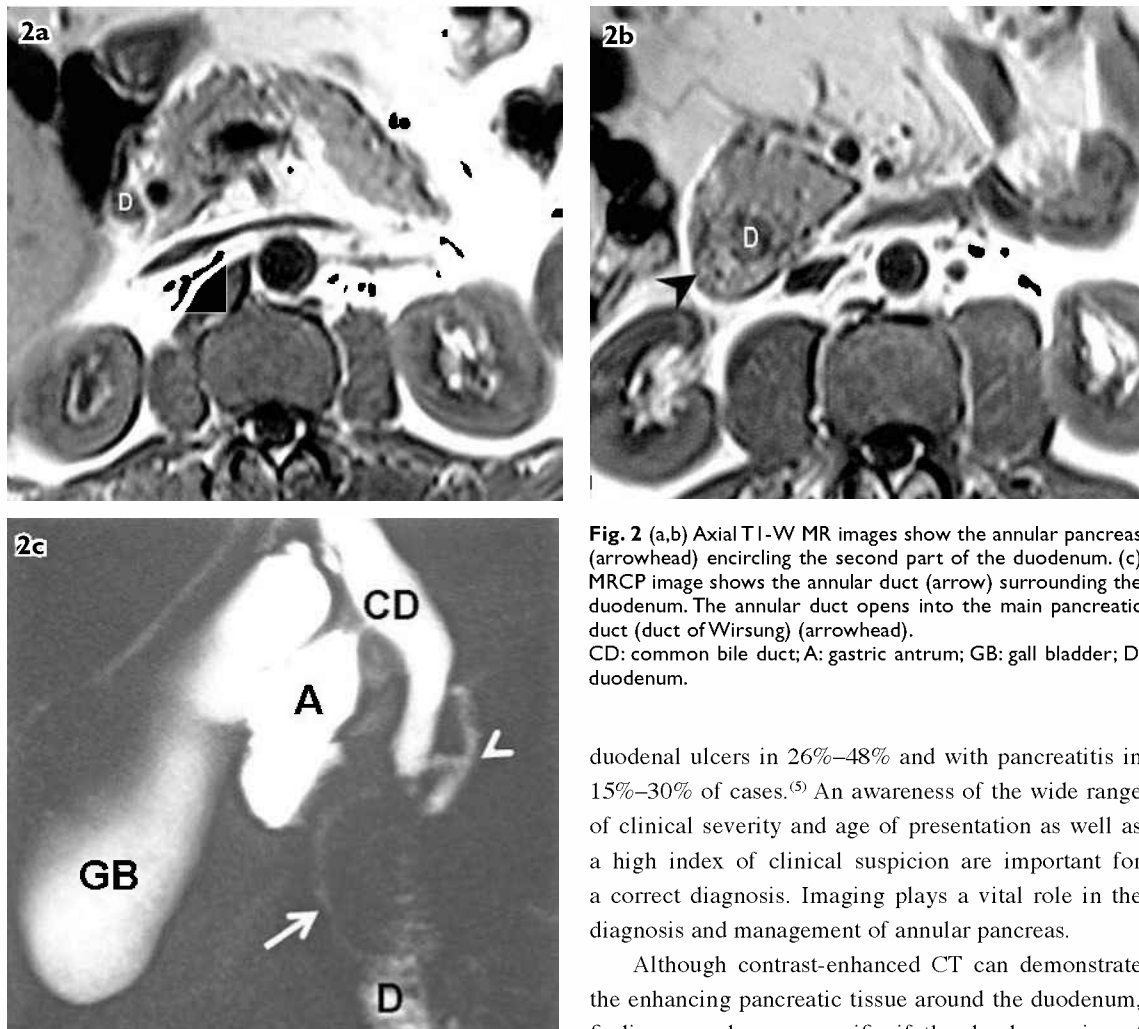
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**Fig. 2** (a,b) Axial T1-W MR images show the annular pancreas (arrowhead) encircling the second part of the duodenum. (c) MRCP image shows the annular duct (arrow) surrounding the duodenum. The annular duct opens into the main pancreatic duct (duct of Wirsung) (arrowhead). CD: common bile duct; A: gastric antrum; GB: gall bladder; D: duodenum.

pancreatic tissue is intermixed with the smooth muscle of the duodenal wall and extends close to the mucosal layer.<sup>(1)</sup> Other associated congenital anomalies including trisomy 21, tracheo-oesophageal fistula, imperforate anus and Hirschsprung's disease are seen in up to 75% of cases.<sup>(4)</sup>

Annular pancreas represents the second most common congenital pancreatic abnormality after pancreas divisum.<sup>(4)</sup> It usually presents in neonates with vomiting due to severe duodenal obstruction. Radiographs in these cases often reveal the characteristic double-bubble sign, representing air in the dilated stomach and the duodenal bulb. Duodenal obstruction in annular pancreas may also result from associated anomalies like duodenal web or stenosis. At the other end of the clinical spectrum, this entity is asymptomatic and remains undetected or only incidentally detected. In others, symptoms of duodenal obstruction or abdominal pain may manifest for the first time in adult life. Obstruction may be heralded by an episode of pancreatitis which causes a narrowing of the duodenum. Annular pancreas can be associated with gastric and

duodenal ulcers in 26%–48% and with pancreatitis in 15%–30% of cases.<sup>(5)</sup> An awareness of the wide range of clinical severity and age of presentation as well as a high index of clinical suspicion are important for a correct diagnosis. Imaging plays a vital role in the diagnosis and management of annular pancreas.

Although contrast-enhanced CT can demonstrate the enhancing pancreatic tissue around the duodenum, findings can be non-specific if the duodenum is not sufficiently opacified, or there is insufficient contrast enhancement of the pancreatic tissue.<sup>(1)</sup> EUS is feasible, even in cases with descending duodenal obstruction, by scanning from the duodenal bulb.<sup>(1)</sup> Although not a primary imaging modality in the diagnosis of annular pancreas, EUS may help clarify the cause of an extrinsic impression on the second part of the duodenum. EUS, unlike ERCP, can not only delineate the duct but also the pancreatic parenchyma surrounding the duodenum. MRCP has the added advantage of being noninvasive and operator-independent, and is capable of delineating the precise ductal anatomy.<sup>(6)</sup> The annular duct usually connects with the main pancreatic duct or the common bile duct near the ampulla but may uncommonly drain directly into the duodenum.<sup>(2,6)</sup>

Endoscopic cholangiopancreatography (ERCP) has a reported diagnostic accuracy of 85% when the annular duct opens into the main pancreatic duct.<sup>(4)</sup> However, ERCP via selective cannulation of the major papilla alone is unrewarding in cases where the annular duct opens into the minor papilla or directly into the duodenum.<sup>(4)</sup> ERCP is also technically difficult in cases with duodenal obstruction. It may aggravate or induce

pancreatitis.<sup>(1)</sup> Barium studies provide only indirect evidence of annular pancreas by revealing eccentric narrowing and medial retraction of the duodenal sweep at the level of the annulus.<sup>(7)</sup> This appearance can also be seen in pancreatitis, pancreatic carcinoma and post-bulbar ulcer.<sup>(7)</sup>

Symptomatic duodenal obstruction due to annular pancreas is treated with duodeno-duodenostomy or duodeno-jejunostomy.<sup>(7)</sup> Division of the annular ring is not recommended, due to a high incidence of postoperative complications like fistula formation, pancreatitis, pancreatic laceration or recurrent duodenal stenosis secondary to local fibrosis.<sup>(7)</sup> In conclusion, MR imaging coupled with MRCP is the ideal technique for the noninvasive diagnosis of annular pancreas. EUS is an emerging and excellent modality to diagnose annular pancreas and should be preferred over ERCP in cases where the diagnosis is first suspected during endoscopy.

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