

Lithiasis of main pancreatic duct in idiopathic chronic pancreatitis

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Section: Abdominal imaging

Area of Interest: Pancreas

Procedure: Diagnostic procedure

Procedure: Cholangiography

Procedure: Endoscopy

Imaging Technique: MR

Imaging Technique: Ultrasound

Imaging Technique: CT

Special Focus: Calcifications / Calculi Case Type:

Clinical Cases

Authors: Tonolini Massimo, MD.

Patient: 63 years, female

Clinical History:

63-year-old lady suffering from persistent, dull upper abdominal pain for two years, with unremarkable findings at physical examination. Medical history included colonic diverticular disease and previous anti-*Helicobacter pylori* eradication therapy for peptic gastritis.

Routine laboratory assays revealed unexpected impaired glucose tolerance, normal liver function, bilirubin, serum lipase and amylase.

Imaging Findings:

CT (Fig.1) showed marked parenchymal atrophy along neck, body and tail of the pancreas, scattered tiny to millimetric calcifications in the pancreatic head, suggestive of chronic pancreatitis (CP). The main pancreatic duct (MPD) was diffusely dilated (maximum calibre 9 mm) upstream to a distal, densely and homogeneously calcified obstructing stone measuring approximately 1.5 cm.

Further questioning and laboratory tests excluded family history of CP and usual causes such as alcohol and hyperparathyroidism.

MRI with MR-cholangiopancreatography (Fig.2) confirmed intraductal stone at distal MPD causing upstream obstruction with associated atrophy of most pancreatic parenchyma; no abnormalities were seen in the biliary tract. Endoscopically, bulging of the Vaterian ampulla was seen, caused from the large stone of the distal MPD, as seen also at endoscopic ultrasound (Fig.3a, b). Attempted endoscopic treatment was unsuccessful since the densely calcified stone obstructed passage to guidewires (Fig.3c), so the patient was sent for extracorporeal shock wave lithotripsy.

Discussion:

Chronic pancreatitis (CP) develops irreversible parenchymal damage from protracted or recurrent inflammation, resulting in progressive impairment of both exocrine and endocrine functions. Albeit alcohol remains by far the commonest cause (75% of cases), the non-alcoholic idiopathic type is becoming increasingly recognised, mostly in patients over 70 years of age; this diagnosis requires exclusion of hypercalcaemia, alcoholism and other identifiable causes [1, 2].

Currently, the widespread use of multidetector CT allows reliable identification of pancreatic calcifications, classically

associated with CP, which vary in size from punctate to centimetric and progressively accumulate over the course of the disease [3-5]. Pancreatolithiasis represent a natural sequel of the ongoing CP process: intraductal stones (IDS) result from deposition of calcium carbonate in obstructed ducts filled with stagnant proteinaceous plugs, and are found in 22% to 66% of patients. IDS in the main pancreatic duct impede outflow of pancreatic secretions, thus causing increased intraductal pressure. Since the pancreas is non-compliant, this mechanism leads to progressive tissue ischaemia, periductal fibrosis and parenchymal atrophy; furthermore, hypertension is involved in the pathogenesis of the characteristic, continuous or episodic pain in CP. In the idiopathic variety, IDS have the same composition but tend to be large and denser than in alcoholic CP [2, 4, 6].

A combination of parenchymal calcification, IDS and atrophy is rather (nearly 80%) specific for CP. Occasionally, pancreatic calcifications are found in neuroendocrine, cystic or pseudopapillary tumours. Albeit carcinoma may complicate CP, it tends to displace calcifications [3-5].

Albeit less sensitive to calcifications compared to CT, MRI confirms decreased pancreatic parenchymal thickness and better depicts on MR-cholangiopancreatography (MRCP) sequences the intraductal location of DS surrounded by fluid, course and caliber of upstream obstructed ducts [7].

Treatment of pancreatolithiasis aims to improve quality of life by relieving ductal hypertension and pain. Currently, small (<5 mm) DS are extracted through endoscopic sphincterotomy using baskets or trawls. Prior to endoscopic retrieval, larger or impacted DS should be fragmented using extracorporeal shock wave lithotripsy or, more recently, pancreatoscopy-guided electrohydraulic lithotripsy. Nowadays surgery is reserved for intractable cases [6, 8-11].

Differential Diagnosis List: Pancreatolithiasis in idiopathic chronic pancreatitis, Alcoholic chronic pancreatitis, Calcified gallstones in the distal choledochus, Duodenal diverticulum filled by calcium, Medication or contrast medium, Pancreatic carcinoma superimposed on chronic pancreatitis, Calcifications in serous or mucinous cystic neoplasm (rare), Calcifications in neuroendocrine tumour (rare), Hereditary chronic pancreatitis (in paediatric or young age)

Final Diagnosis: Pancreatolithiasis in idiopathic chronic pancreatitis

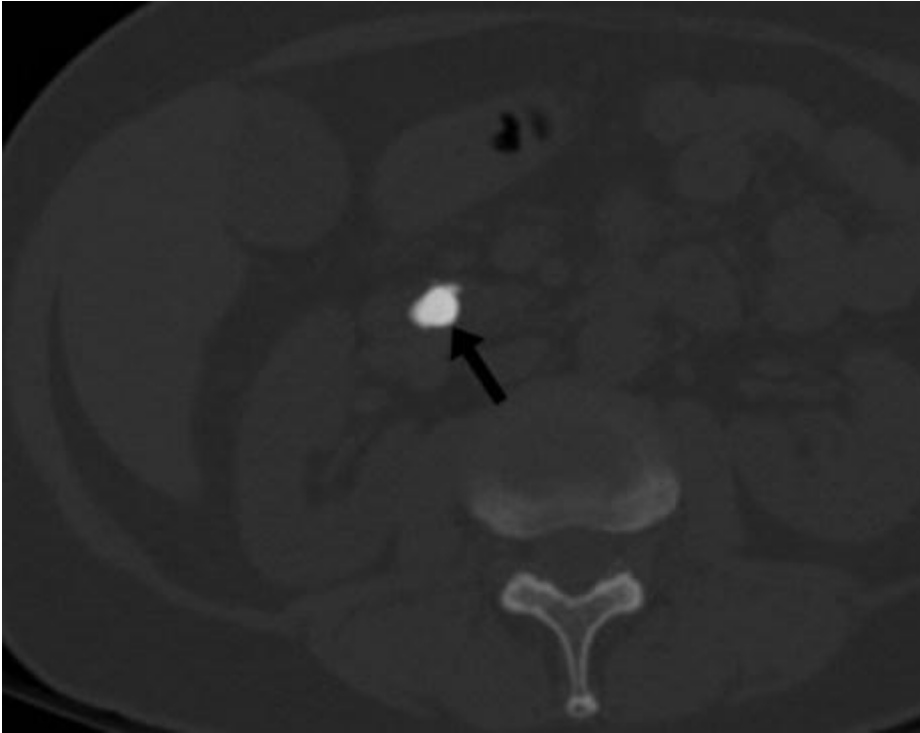
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pancreatic duct stones. Endoscopy 49:E147-e148. (PMID: [28464202](#))

Figure 1

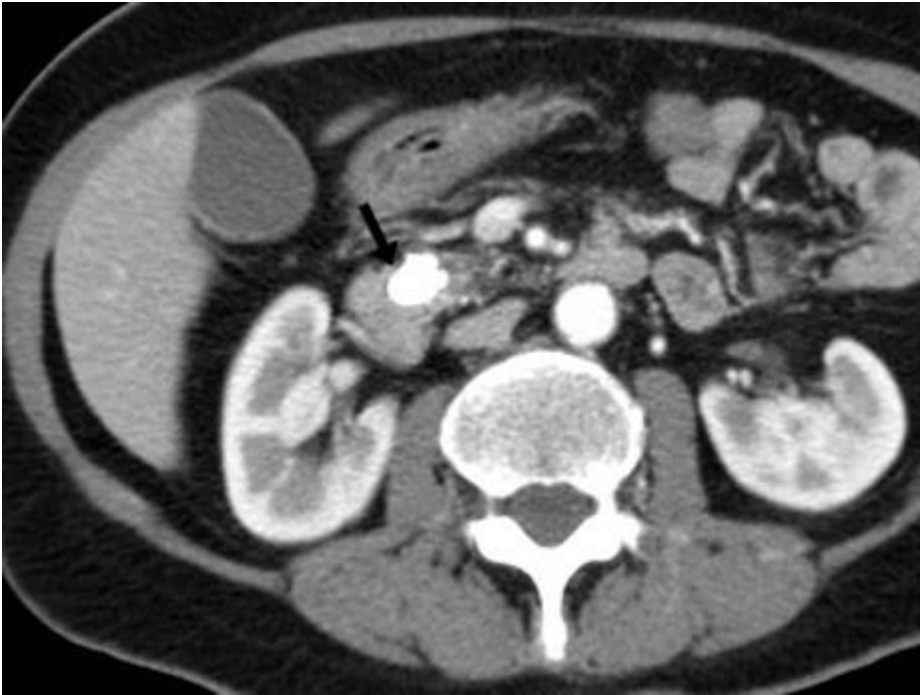
a



Description: Precontrast images viewed at bone window settings showed a 1.5cm calcification (black arrow) at the site of the Vaterian ampulla, with strong homogeneous hyperattenuation (average \pm standard deviation 2600 \pm 45 Hounsfield units).

Note normal-appearing gallbladder, absent peripancreatic fluid. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

b



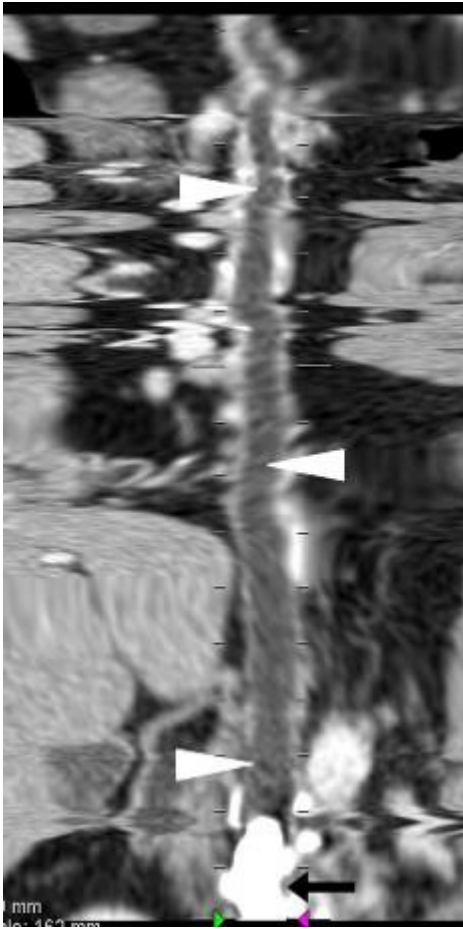
Description: The portal-venous enhanced acquisition confirmed a 1.5cm dense calcification (black arrows) at the site of the Vaterian ampulla. Note normal-appearing gallbladder, absent peripancreatic fluid. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

c



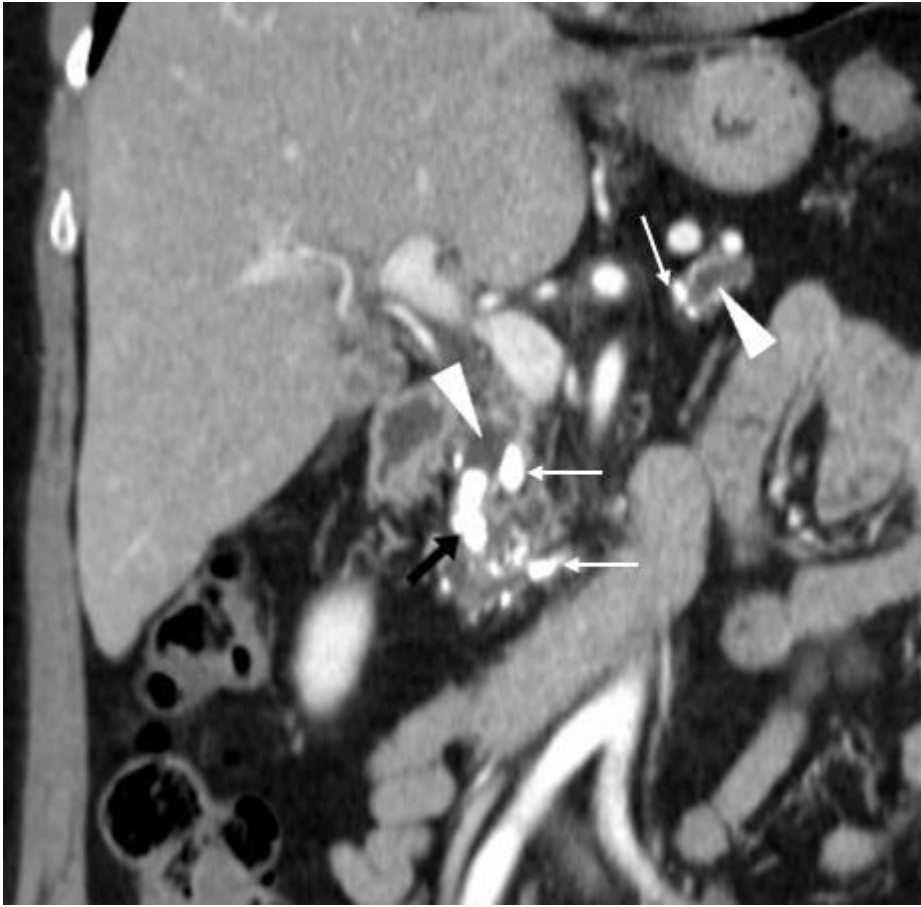
Description: Oblique (c) and curved (d) planar reformations showed the intraductal location of the dense calcification (black arrows) and the marked upstream dilatation (maximum 9 mm) of the main pancreatic duct (MPD, arrowheads). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

d



Description: Oblique (c) and curved (d) planar reformations showed the intraductal location of the dense calcification (black arrows) and the marked upstream dilatation (maximum 9 mm) of the main pancreatic duct (MPD, arrowheads). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

e



Description: Several smaller, mostly tiny pancreatic calcifications (thin arrows) were present, particularly in the head. Note dense MPD stone (black arrow in e), dilated upstream MPD (arrowheads) with parenchymal atrophy along neck, body and tail. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

f



Description: Several smaller, mostly tiny pancreatic calcifications (thin arrows) were present, particularly in the head. Note dense MPD stone (black arrow in e), dilated upstream MPD (arrowheads) with parenchymal atrophy along neck, body and tail. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

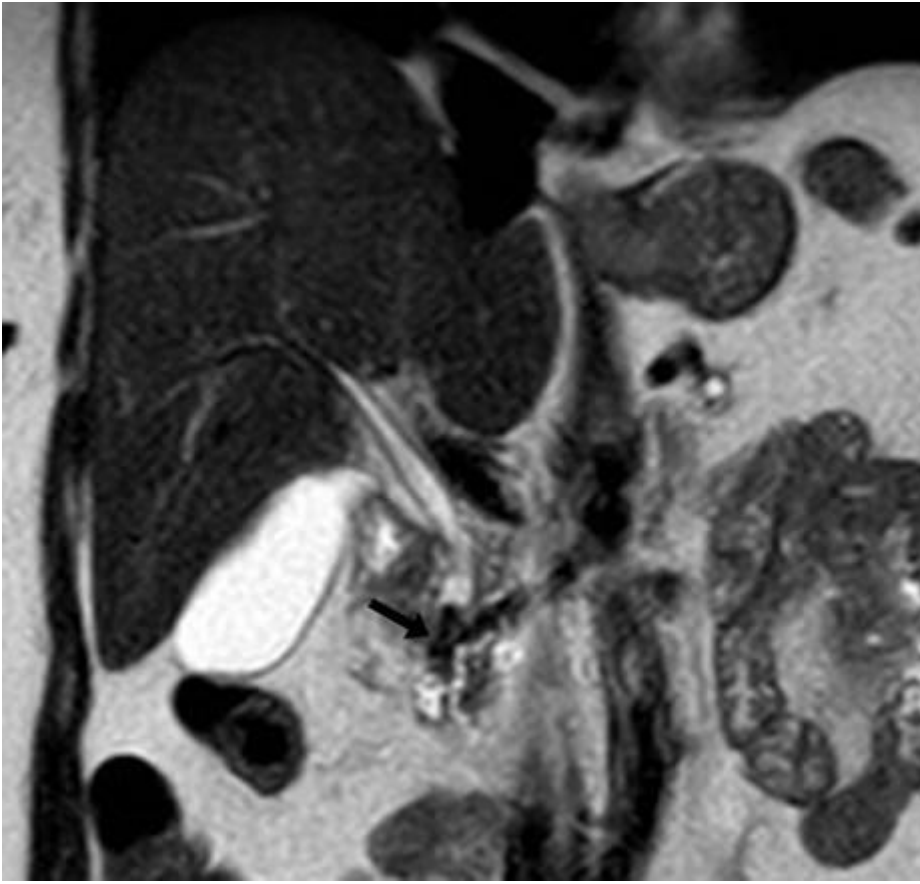
Figure 2

a



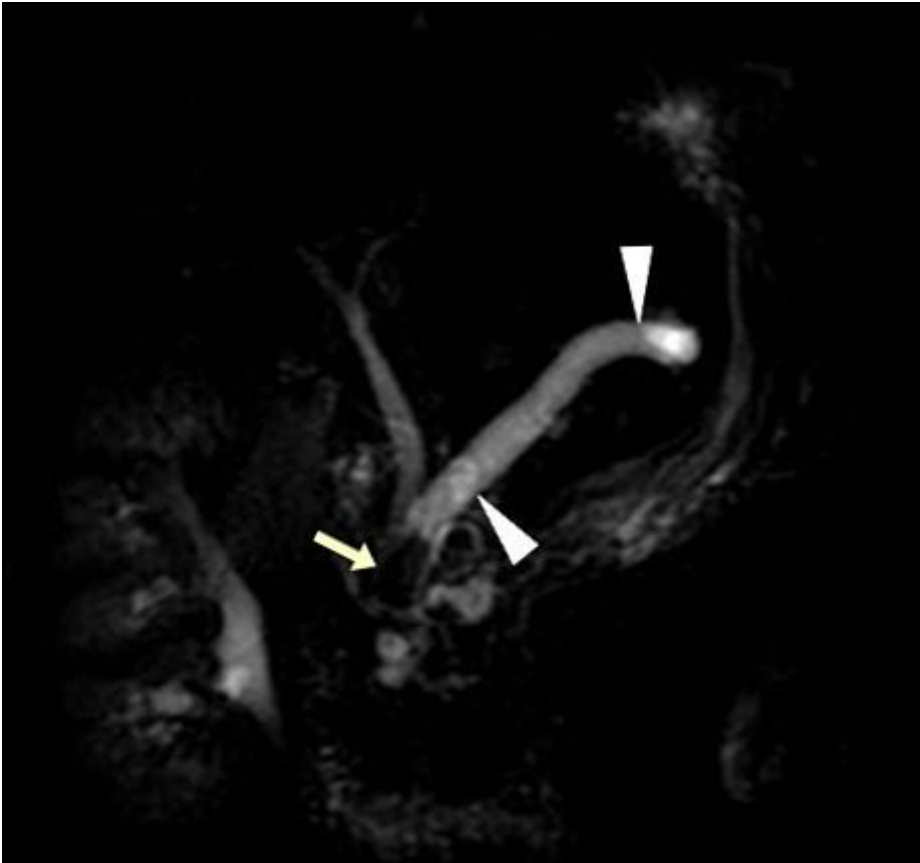
Description: Axial (a) and coronal (b) T2-weighted images confirmed low-signal stone (black arrow) at termination of MPD, surrounded by intraductal hyperintense fluid. Note normal-appearing gallbladder, absent peripancreatic fluid. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

b



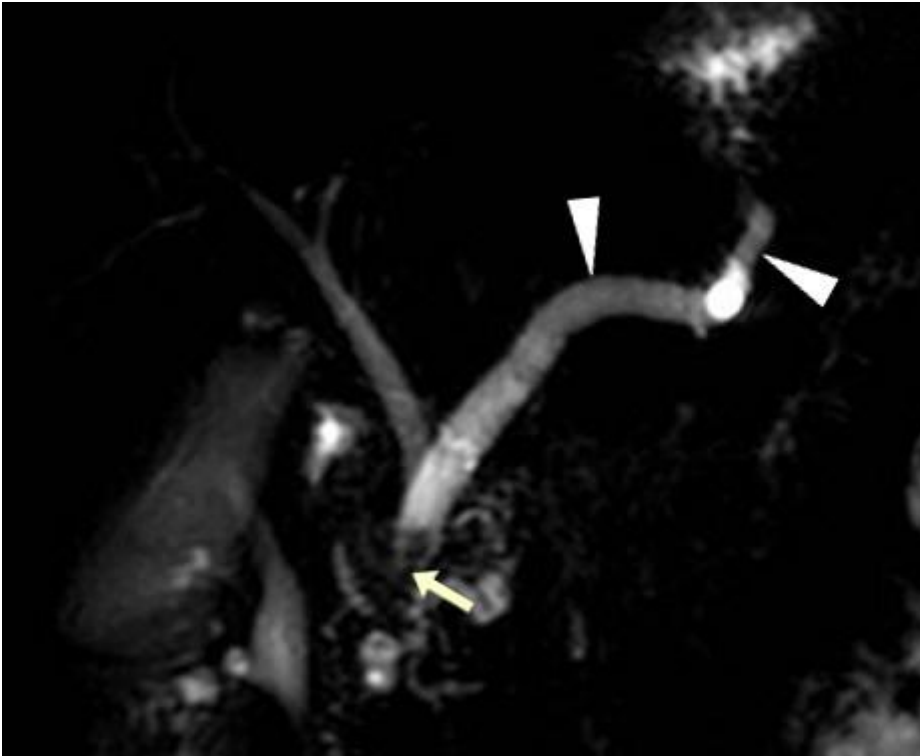
Description: Axial (a) and coronal (b) T2-weighted images confirmed low-signal stone (black arrow) at termination of MPD, surrounded by intraductal hyperintense fluid. Note normal-appearing gallbladder, absent biliary obstruction. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

c



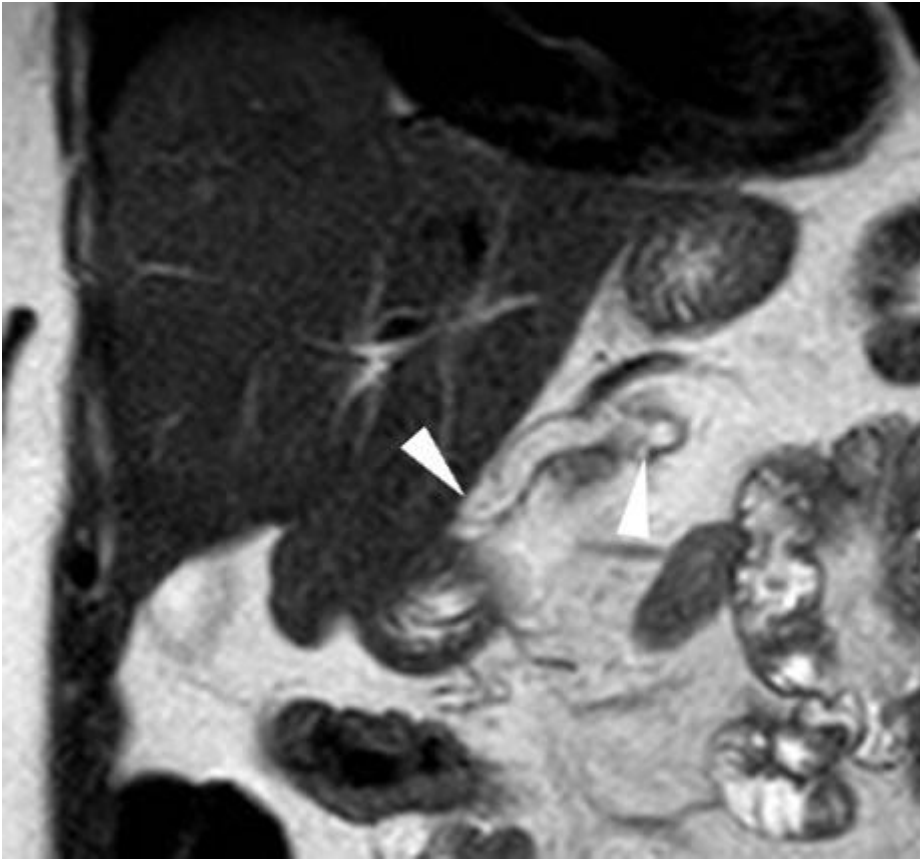
Description: MRCP images (c,d) confirmed dilated MPD (arrowheads), distally obstructed by the strongly hypointense intraductal stone (arrows). Note normal-appearing intrahepatic and common bile ducts. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

d



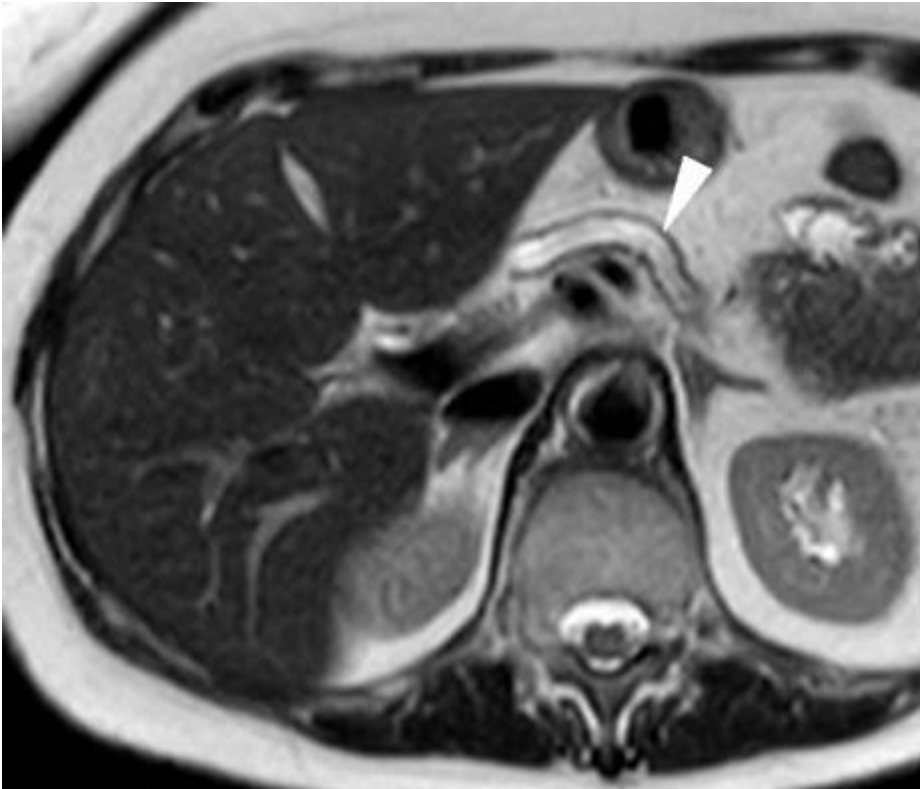
Description: MRCP images (c,d) confirmed dilated MPD (arrowheads), distally obstructed by the strongly hypointense intraductal stone (arrows). Note normal-appearing intrahepatic and common bile ducts. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

e



Description: Additionally, T2-weighted images (e,f) confirmed pancreatic atrophy with marked parenchymal thinning along neck, body and tail, surrounding the dilated MPD (arrowheads). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

f



Description: Additionally, T2-weighted images (e,f) confirmed pancreatic atrophy with marked parenchymal thinning along neck, body and tail, surrounding the dilated MPD (arrowheads). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

Figure 3

a



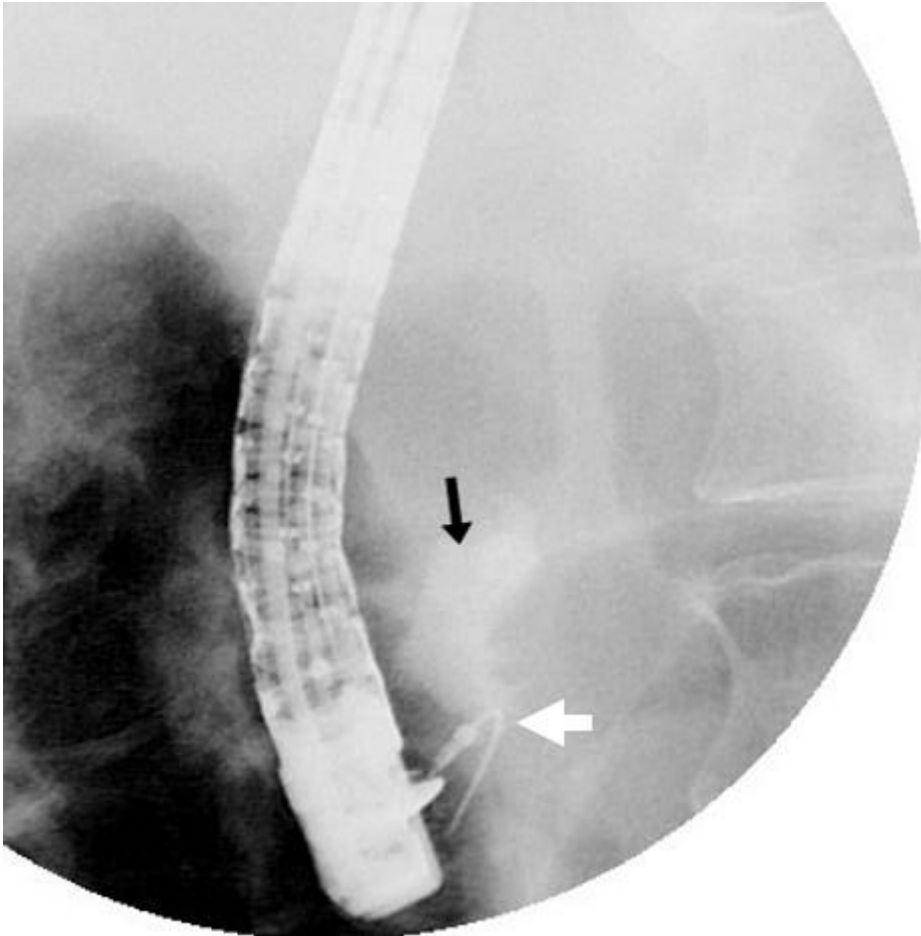
Description: EUS images (a, b) confirmed hyperechoic intraductal stone (arrows) of distal MPD, causing posterior shadowing (in a). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

b



Description: EUS images (a, b) confirmed hyperechoic intraductal stone (arrows) and dilated upstream MPD (arrowhead in b). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)

c



Description: Endoscopically, bulging of the Vaterian ampulla was seen, caused from radiographically dense stone (black arrows) which obstructed passage to guidewires (thick arrow). **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)