



Magnetic Resonance Cholangiopancreatography (MRCP)

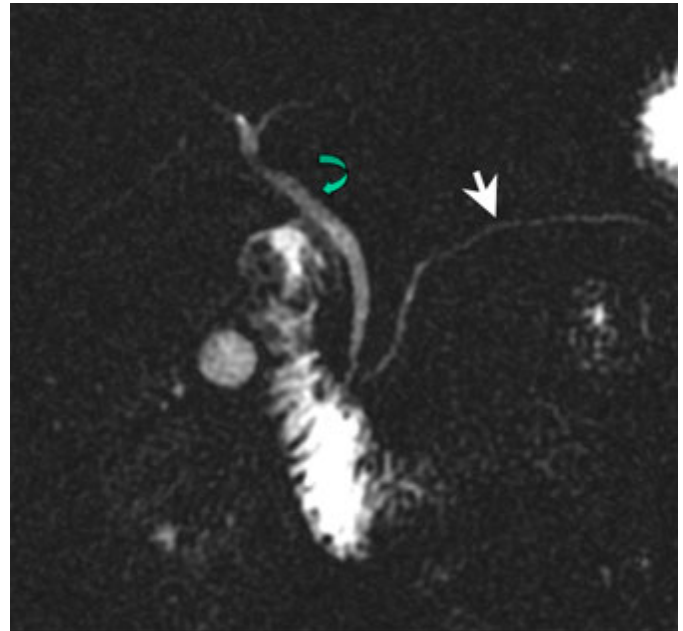
When patients have suspected biliary or pancreatic disease, ultrasound imaging is the traditional screening technique. However, ultrasound is limited in its ability to image abnormalities in the biliary and pancreatic ductal systems and further evaluation may be necessary with either endoscopic retrograde cholangiopancreatography (ERCP) or MRCP.

ERCP is a minimally invasive procedure that combines endoscopy with the injection of iodinated contrast agent into the biliary and pancreatic ducts. ERCP has the advantage of combining diagnosis with intervention. In addition, manometry can be performed and the ampulla can be directly visualized. However, ERCP carries a small but significant risk of complications, including pancreatitis, hemorrhage, and perforation. At MGH, the complication rate is 1-2%, significantly lower than the national average. In addition, ERCP may be difficult in patients with post-surgical anastomotic complications.

MRCP is a less costly, non-invasive, and sensitive technique for evaluating the biliary and pancreatic ductal systems. In MRCP, multiplanar images are obtained parallel to the orientation of the biliary tree, using an MR sequence that is sensitive to static fluid without the need for exogenous contrast agents. Fluid in the ducts appears bright against the darker tissue. Image post-processing (maximal intensity projection) is used to make multi-dimensional images of the entire biliary tree and the pancreatic ducts. Although MRCP images have somewhat lower resolution than ERCP, MRCP shows the ducts in their natural, non-distended state and can easily be combined with MRI of the surrounding viscera.

Diseases Diagnosed by MRCP

MRCP can diagnose the presence of bile duct obstruction and the level of obstruction in most cases. Biliary calculi smaller than 6 mm can be missed although 2 mm calculi can be seen in some cases. Primary sclerosing cholangitis can be diagnosed from the multiple irregular strictures seen in the biliary ducts. Benign and malignant causes of biliary dilatation can be differentiated and, as MRCP can be coupled with imaging of the adjacent viscera, malignant neoplasms and metastases can be detected and evaluated. MRCP has an advantage over ERCP for the detection of cholangiocarcinoma, since there is a risk sepsis following ERCP. Post-operative bile-duct injuries and anastomotic leaks can be readily detected with MRCP



Normal MRCP image showing the common bile duct (curved arrow) and the pancreatic duct (arrow). Note the fluid filled duodenum.

and it is suitable for assessment of the biliary tree after orthotopic liver transplantation.

In patients with recurrent pancreatitis, MRCP can be performed to look for stones, divisum, or strictures. MRCP in conjunction with MRI can be used to evaluate parenchymal changes due to pancreatitis or to detect pancreatic cancer.

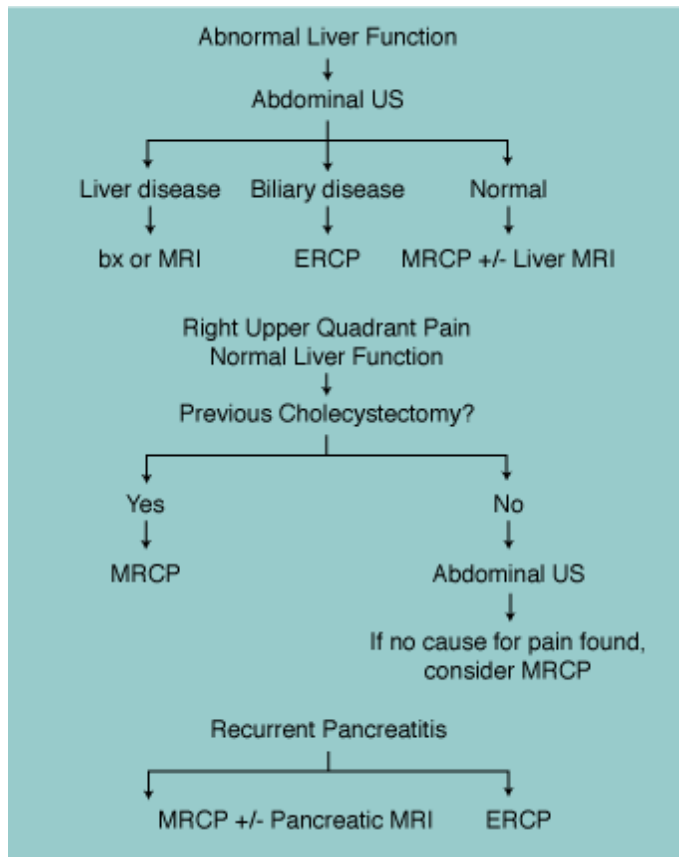
Biliary Disease

- Cystic disease of bile duct (choledochal cyst, choledochocoele, Caroli's disease)
- Congenital variants (low or medial duct insertion, aberrant right hepatic duct)
- Choledocholithiasis
- Primary sclerosing cholangitis
- Post-surgical biliary complications
- Cholangiocarcinoma

Pancreatic Disease

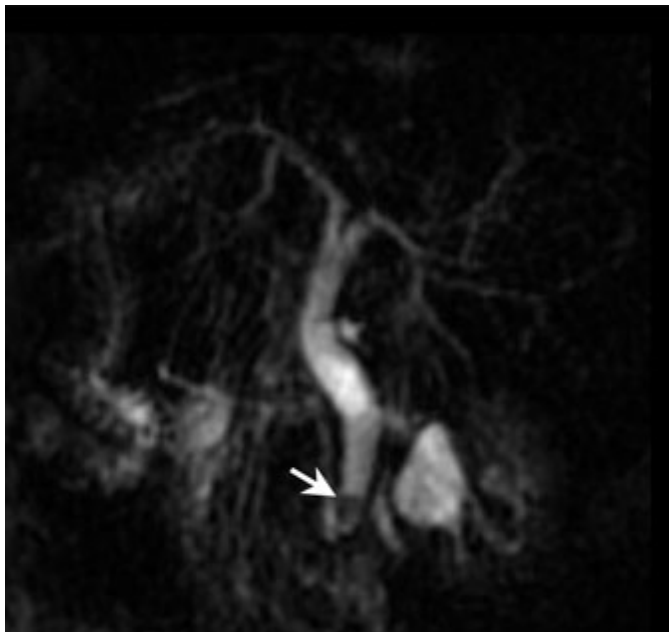
- Pancreas divisum
- Chronic pancreatitis
- Pancreatic cancer

General Guidelines for the Selection of MRCP or ERCP



MRCP should be considered as alternative to ERCP or prior to ERCP for:

- Pediatric patients, elderly patients, and those with many comorbidities
- Acute pancreatitis
- Cholangitis



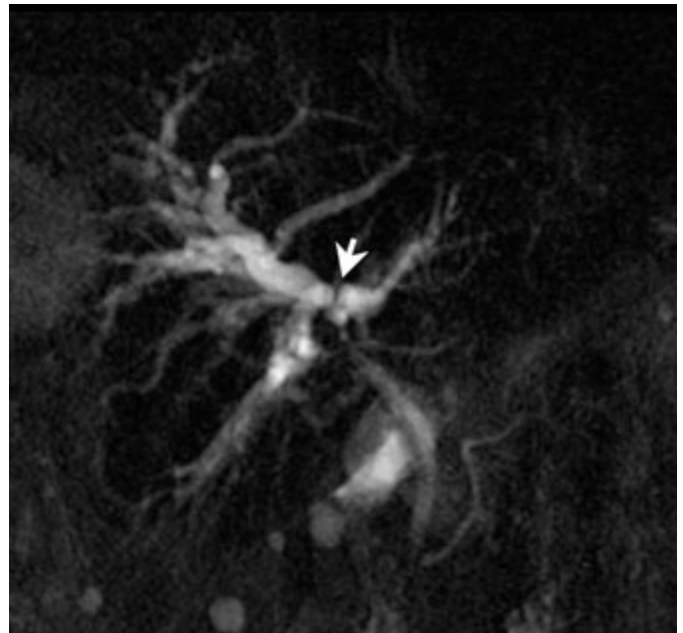
Common Bile Duct Stone. MRCP image shows a dilated bile duct with a dark stone (arrow) in its distal end.

Limitations

Low grade strictures may be missed and may be seen better with ERCP because distension and higher resolution of this examination. Occasionally, false positive diagnoses of bile duct stones or obstruction result from air bubbles, blood clots, metallic clips, or extra-ductal compression.

Patient Preparation and MRCP Procedure

No patient preparation is required for MRCP but fasting 2-4 hours prior to the examination can be beneficial because it reduces the fluid in the gastric antrum and the duodenum, which may overlie the ducts. The MRCP examination takes 30-40 minutes. If a complete MRI of the liver and pancreas is necessary, the entire procedure takes about one hour and may include the administration of a contrast agent.



Klatskin Tumor of the Bile Duct. MRCP image shows dilatation of intrahepatic ducts along with stricture from the tumor seen at the confluence of right and left intrahepatic ducts (arrow). Note the normal caliber of distal common bile duct and pancreatic duct.

Scheduling

MRCP can be performed at Mass General West Imaging in Waltham, Mass General Imaging in Chelsea, MassGeneral MRI in Charlestown, or the main MGH campus (including the Emergency Department) and can be ordered online via the [Radiology Order Entry \(ROE\)](#) system or by calling 4-XRAY (617-724-9729).

Further Information

For further questions on MRCP, please contact [Mukesh Harisinghani, MD](#), 617-726-8396, Division of Abdominal and Interventional Radiology or [Peter Kelsey, MD](#), 617-724-6044, Gastrointestinal Unit.

References

Fayad, LM, Kowalski, T and Mitchell, DG. (2003) *MR cholangiopancreatography: evaluation of common pancreatic diseases*. Radiol Clin North Am **41**: 97-114

Kalra, M, Sahani, D, Ahmad, A and Saini, S. (2002) *The role of magnetic resonance cholangiopancreatography in patients with suspected biliary obstruction*. Curr Gastroenterol Rep **4**: 160-6

Lopez Hanninen, E, Amthauer, H, Hosten, N, Rieke, J, et al. (2002) *Prospective evaluation of pancreatic tumors: accuracy of MR imaging with MR cholangiopancreatography and MR angiography*. Radiology **224**: 34-41

Romagnuolo, J, Bardou, M, Rahme, E, Joseph, L, et al. (2003) *Magnetic resonance cholangiopancreatography: a meta-analysis of test performance in suspected biliary disease*. Ann Intern Med **139**: 547-57

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