TRA-MINW

MRI Abdomen Protocol – MRCP WO CONTRAST

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Standard uses, ONLY for the following *(for any other indication, use MR Pancreas/MRCP with contrast protocol)*

1. Biliary stones (choledocholithiasis)
2. FOLLOW-up pancreatic cyst

    NOTE: if this is for INITIAL evaluation of pancreatic cyst, use MR Pancreas/MRCP with contrast protocol

3. Contraindication to IV MRI contrast (anaphylaxis, severe bronchospasm, laryngeal edema).

Notes: If the primary indication does not specify concern for biliary stones/choledocholithiasis or FOLLOW-UP pancreatic cyst, then MR pancreas/MRCP with contrast should be performed.

Patient prep: Should be NPO for 2 hours prior to study. Fluid in the stomach and proximal small bowel interferes with thick slab images. Have patient void prior to scan.

Oral contrast: None.

Coil: Body coil.

Coverage: Position the coil such that there is good coverage and signal from the liver and pancreas. Ensure that entire liver and pancreas are covered on all series.

Intravenous contrast: None.

Anti-peristaltic agent: None.

Sequences:

1. **Localizer**
2. **Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE)**

a. Multi-breath hold as needed
b. Complete front to back coverage
c. Goal parameters
    i. Large FOV (400-450 mm)
    ii. 7 mm thickness, 25% gap (1.5 mm)

3. Axial in and out of phase T1 GRE
a. Perform as 1 acquisition
b. Multi-breath hold as needed
c. Full FOV
d. Slices extend from dome of liver to inferior aspects of liver and pancreas
    i. 6 mm thickness, 25% gap (1.5mm)
    ii. Ensure entire liver is covered

4. Axial T2 Ultra fast SE (HASTE, SSFSE, FASE) thin slice withOUT fat suppression
a. Multiple breath holds as needed
b. Slices should include coverage of the intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
    i. Include all of liver if indication is “Primary sclerosing cholangitis (PSC)”
c. Goal parameters
    i. Slice thickness 3-4 mm, 0% gap

5. Axial T2 Ultra fast SE (HASTE, SSFSE, FASE) thin slice with fat suppression
a. Multiple breath holds as needed
b. Slices should include coverage of the intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
    i. Include all of liver if indication is “Primary sclerosing cholangitis (PSC)”
c. Goal parameters
    i. Slice thickness 3-4 mm, 0% gap

6. Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE) thin slice with fat suppression
a. Core “MRCP” sequence
b. Multiple breath holds as needed
c. Slices should include coverage of the intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
    i. Include all of liver if indication is “Primary sclerosing cholangitis (PSC)”
d. Goal parameters
    i. Slice thickness 3-4 mm, 0% gap

8. Coronal 3D T2 TSE (SPACE, CUBE, VISTA)
a. First choice if available, preferred “MRCP” sequence
b. Respiratory navigated
c. Slices should include coverage of the intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
    i. Include all of liver if indication is “Primary sclerosing cholangitis (PSC)”
d. 3D MIP recons with 2 plane rotation

9. OPTIONAL – Perform when coronal 3D T2 TSE (#7) not of high quality

Oblique - 15 degree Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE) **thin slice with fat suppression**

a. Slices include central intrahepatic ducts, CBD and pancreatic duct
b. Goal parameters
    i. TE ~ 120 ms (less for 3T)
    ii. Slice thickness 3-4 mm, 0% gap

10. OPTIONAL – Perform when coronal 3D T2 TSE (#7) not of high quality

Oblique + 15 degree Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE) **thin slice with fat suppression**

a. Slices include central intrahepatic ducts, CBD and pancreatic duct
b. Goal parameters
    i. TE ~ 120 ms (less for 3T)
    ii. Slice thickness 3-4 mm, 0% gap

10. Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE) thick slab (30 mm)

a. Repeat at least 15 times
b. Respiratory trigger with multiple breath holds as needed
c. *Center on epigastric region* - slices include distal CBD/Pancreatic duct and duodenum
d. Goal: Obtain at least 1 image with an open sphincter of Oddi

11. Axial steady-state free precession (True-FISP, FIESTA, b-FFE) with fat saturation

a. Full FOV
b. Slices extend from dome of liver to inferior aspects of liver to cover entire portal vein

12. Coronal steady-state free precession (True-FISP, FIESTA, b-FFE) with fat saturation

a. Full FOV
b. Slices extend from dome of liver to inferior aspects of liver to cover entire portal vein

13. Axial DWI with ADC map

a. Free breathing
b. Slices extend from dome of liver to inferior aspects of liver and pancreas to include all intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
c. Mandatory parameters
    i. B = 0/100/500/1000 and ADC map

14. Axial T1 Ultra fast GE with fat suppression (VIBE, LAVA, TIGRE) precontrast

a. Breath hold
b. Slices extend from dome of liver to inferior aspects of liver and pancreas to include all intrahepatic biliary tree, extrahepatic biliary tree and pancreatic duct
c. Goal parameters
    i. Slab slices <= 3 mm

Radiologist's perspective:

Noncontrast MRCP has only two primary indications: evaluate for biliar sontes (choledocholithiasis) or FOLLOW-UP evaluation of pancreatic cyst. **If choledocholithasis or FOLLOW-UP pancreatic cyst are not the specific indication, then MR pancreas/MRCP with contrast protocol should be performed** as biliary and pancreatic malignancies are common causes for biliary ductal dilatation.

NOTE: **MR Pancreas without and with contrast protocol is preferred in patients with primary sclerosing cholangitis (PSC)** as they have a higher incidence of cholangiocarcinoma.

Different scanners have different capabilities to perform various MRCP sequences:

-All scanners have the capabilities to perform the thick slab heavily T2 weighted sequences. These should be performed in the coronal on all patients. If the coronal is not optimal or otherwise compromised, this should be performed in the RAO, and LAO planes.

-Some newer scanners have the ability to perform a 3D acquisition T2 weighted turbo spin echo sequence. This is acquired with respiratory triggering.

Appendix:

Table 1 Summary of MRCP imaging parameters

Parameter	T2-weighted breath-hold HASTE (liver down to ampulla)	3D T2-weighted FSE with respiratory triggering	T2 weighted breath-hold HASTE fat-saturated thick slab
TR/TE (ms)	1,000/83	1,800/678	4,500/752
Number of averages	1	1	1
Flip angle	150	180	180
Field of view (mm)	350 × 263	380 × 380	350 × 350
Matrix size	256 × 146	384 × 380	384 × 300
Slice thickness (mm)	7 mm	1.5 mm	40 mm
Slice gap (mm)	0.7 mm	0 mm	N/A
Number of slices	20	40	1
Acquisition plane	Axial	Coronal oblique	Coronal
Half-Fourier factor	5/8	Phase-encoding: off Slice-encoding: 6/8	Phase encoding: 7/8
Parallel imaging acceleration factor	2	2	2
Receiver bandwidth (Hz/pixel)	391	260	150
Turbo factor	146	127	307
Oversampling	None	Slice: 20%	Phase: 33%

HASTE half-Fourier acquisition single shot turbo spin echo, *FSE* fast spin echo

References

1. Griffin, N., Charles-Edwards, G. & Grant, L. A. Magnetic resonance cholangiopancreatography: the ABC of MRCP. Insights Imaging 3, 11–21 (2011).