TRA-MINW

MRI Abdomen Protocol – Liver

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Standard uses: Liver lesion, cirrhosis & HCC, metastases to liver, indeterminate liver lesions – everything but focal nodular hyperplasia (FNH).

Notes: Refer to 'Liver Eovist' protocol if there is specific request or mention of 'focal nodular hyperplasia (FNH)'; otherwise assume all livers are MultiHance.

Patient prep: Should be NPO for >4 hours prior to study if possible. Have patient void before examination.

Oral contrast: None.

Coil: Body coil.

Coverage: Position the coil such that there is good coverage and signal from liver and pancreas.

Intravenous contrast: Single dose gadolinium @ 2 cc / sec (MultiHance).

Anti-peristaltic agent: None.

Sequences:

1. Localizer
    a. Breath hold

2. Coronal T2 Ultra fast SE (HASTE, SSFSE, FASE)
    a. Breath hold, concatenation/Multi-breath hold is less desirable than single breath hold
    b. Complete front to back coverage (skin to skin)
    c. Goal parameters
        i. Large FOV (400-450 mm)
        ii. 7 mm thickness, 25% gap (1.5 mm)

3. Axial T1 in-phase and out-of-phase GRE
    a. Breath hold, concatenation/Multi-breath hold is less desirable than single breath hold

   b. Slices extend from dome of liver to inferior aspects of liver and pancreas
   c. Goal parameters
      i. 6 mm thickness, 25% gap (1.5mm)

4. Axial T2 Ultra fast SE (HASTE, SSFSE, FASE)
   a. Breath hold, concatenation/Multi-breath hold is less desirable than single breath hold
   b. Slices extend from dome of liver to inferior aspects of liver and pancreas
   c. Goal parameters
      i. 6 mm thickness, 25% gap (1.5mm)

5. Axial T2 Ultra fast SE (HASTE, SSFSE, FASE) fat suppressed
   a. as in 4., but with fat suppression

6. Axial T1 Ultra fast 3D-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
   c. Goal parameters
      i. Slab slices <= 3 mm

7. Axial T1 VIBE post-contrast x3 (late arterial, portal venous, equilibrium phases)
   a. Breath holds
   b. Slices extend from dome of liver to inferior aspects of liver and pancreas
   c. Goal parameters
      i. Slab slices <= 3 mm
      ii. If available, all studies should be performed with bolus tracking in the abdominal aorta.
         1. Bolus tracking (preferred): tart image acquisition with delay listed below after bolus arrives in aorta
            a. Late arterial = +5 s, portal venous = +35 s, equilibrium = +100s

            OR

         2. Fixed scan delay (time from beginning injection until center of k-space)
            a. No heart disease: Late arterial = 30 s, portal venous = 60 s, equilibrium = 120 s
            b. Heart disease: Late arterial = 35 s, portal venous = 65 s, equilibrium = 125 s

8. Coronal T1 Ultra fast 3D-GE with fat suppression (VIBE, LAVA, TIGRE)
   a. Breath hold
   b. Cover liver and pancreas
   c. Timing – performed immediately after 3rd postcontrast VIBE in 7. above.

9. Axial DWI/ADC
   a. Free breathing
   b. Same coverage
   c. Goal parameters
      i. B-values of 0, 100, 500, 1000 and ADC map

10. Axial Ultra fast 3D-GE with fat suppression (VIBE, LAVA, TIGRE) 5 minute delay

11. Post-contrast subtractions should be included for all phases (4 total)

Radiologist's perspective:

This is one of the most common exams performed. Correct contrast agent selection is critical (Multihance vs Eovist). MultiHance is the default liver imaging agent unless there is specific request /recommendation or if there is mention of possible 'focal nodular hyperplasia (FNH)'.

Another important factor is correct timing of post contrast images. This is vital in diagnosing hepatocellular carcinoma in cirrhotic patients. Incorrect timing of post contrast images can easily obscure a significant cancer. Automated bolus detection and timing bolus techniques produce the most consistent results and are preferred where power injectors and scanner capabilities allow. In cases where this is not possible, a fixed delay after a manual injection is performed.

We rely on the technologist skill and experience with each individual scanner to achieve the correct timing of post contrast images. The most important acquisition is the first post contrast images. This should be performed in the **"late arterial" phase**. In this phase**, contrast is in the arteries and portal veins but not the hepatic veins**. When performed incorrectly, we have noticed that the mistake is usually scanning too early, in the "early arterial" phase. This is recognized when there is contrast in the arteries but not the portal veins. Please review these images with each patient so that corrections can be made for the next patient.

Please direct any questions or concerns to any of the body radiologists.