Vascular and Extravascular Complications of Liver Transplantation: Comprehensive Evaluation with 3D Volumetric MR Imaging

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Introduction: Complications of liver transplant surgery include vascular, biliary, parenchymal, and extrahepatic disease. Accordingly, multiple imaging techniques are often required for the evaluation of a patient at risk for graft failure or recurrent hepatoma, including conventional arteriography, ultrasound, CT, and MR imaging. The recent development of a volumetric 3D gradient-echo sequence that provides near isotropic imaging (pixel size ≤2.3mm) of the entire abdomen in a breath-hold offers the potential for a comprehensive evaluation of vascular, parenchymal, and extravascular complications in liver transplant recipients.

Materials and Methods: Nineteen consecutive patients (21-67 years old, 15 men, 4 women) were referred to our institution for MR evaluation 2 days to 62 months post-transplantation. Five patients had up to three repeated examinations. Original indications for transplant included hepatoma (n=6), infectious hepatitis (n=9), and other (n=4). Indications for referral included abnormal Doppler examinations of the hepatic arteries, elevated liver function tests, elevated alpha-fetoprotein (AFP), and abdominal pain. All were imaged using a volumetric 3D gradient-echo sequence (4.2-4.7/1.8-1.9/12-30°) with an intermittent fat saturation pulse and interpolation in the slice select direction to obtain near isotropic pixel size ≤2.3mm in all dimensions within a breath-hold (average acquisition time=20 seconds). All patients underwent unenhanced and three enhanced studies (arterial, portal venous, and delayed venous phase) following an average of 0.13 mmol/kg Gd-DTPA. The arterial phase acquisition time was timed based on a test dose of contrast. In a subset of patients, dedicated evaluation of the biliary system was performed using half-fourier turbo-spin echo (HASTE). Each exam was evaluated for vascular anatomy and patency, liver parenchymal disease, and extrahepatic abnormalities.

Results: Vascular complications at MR included hepatic arterial thrombosis (n=1), hepatic arterial attenuation (n=2), celiac stenosis (n=2), and portal vein stenosis (n=1). Three patients had subsequent conventional angiography confirming MR angiographic abnormalities in two, and showing less severe arterial disease than that predicted by MR in one. Liver parenchymal abnormalities were identified in three patients and consisted of a single mass (n=1) or multiple masses (n=2); two of these patients had presumed recurrent hepatoma. Extrapancreatic disease included extrahepatic tumor: lung (n=3), adrenal (n=2), vertebral body (n=1), and lymphadenopathy (n=2). Biliary abnormalities detected included a focal anastomotic stricture confirmed with cholangiography (n=1), and biloma (n=2). Biliary anastomotic stenosis and leak were not detected in one patient who did not undergo HASTE imaging during MR evaluation. Other abnormalities included splenic infarct (n=1), aortic dissection (n=1), incisional hernia (n=1), and seroma (n=1).

Discussion: MR imaging using a dynamic, contrast-enhanced, volumetric 3D gradient echo sequence that provides near isotropic imaging of the entire abdomen in a breath-hold in conjunction with dedicated MRCP sequences can provide a comprehensive evaluation of vascular, parenchymal, and extrahepatic complications for liver transplant recipients.