Magnetic Resonance Cholangiography in the Diagnosis of Biliary Complications After Orthotopic Liver Transplantation


ABSTRACT

Objective. The aim of our study was to evaluate the role of magnetic resonance cholangiography (MRC) in the diagnosis of biliary tract complications (BC) after orthotopic liver transplantation (OLT).

Materials and Methods. Among 21 OLT patients who underwent routine follow-up MRC using a breath-hold T2-weighted turbo spin-echo sequence with half-Fourier acquisition (HASTE), 5 had an elevated serum alkaline phosphatase level. Diagnostic confirmation was obtained with endoscopic retrograde cholangiography (ERC) (n = 11), surgery (n = 3), or clinical and laboratory follow-up of at least 1 year (n = 8).

Results. In 13 patients, no abnormality of the biliary tract was detected using MRC. In 8 patients, anastomotic strictures were diagnosed, 7 of which were confirmed at surgery or using ERC. One patient with normal findings at MRC and abnormal liver function test results was found to have a stricture at ERC. All patients with normal MRC and liver function tests had 1 year of uneventful follow-up and were considered true-negative cases. We found that MRC had 87.5% sensitivity, 92.3% specificity, 87.5% positive predictive value, 92.3% negative predictive value, and 90.4% accuracy for the diagnosis of BC.

Conclusion. MRC is a valuable examination to detect BC after OLT. It provides useful information for planning interventional procedures.

Despite recent improvements in orthotopic liver transplantation (OLT) largely due to more efficient immunosuppressants, graft preservation solutions, and advanced surgical techniques, biliary tract complications (BC) remain a frequent cause of morbidity. The reported rates range from 15% to 50%.\(^1\)\(^-\)\(^10\) The BC include leak, obstruction, stone formation, and strictures. Early diagnosis of BC is notoriously difficult, in part due both to the insidious clinical manifestations and to the limited specificity of biochemical studies. Hepatic and biliary tract enzymes have been shown to increase as a result of graft preservation injuries, acute or chronic rejection, ischemic insults, cholangitis, viral infections, drug toxicity, or obstructive biliary lesions. Therefore, imaging plays a vital role in defining the etiology of the biochemical abnormalities.\(^1\)\(^1\) Previous studies have demonstrated the limited efficacy of ultrasound to define the presence and level of biliary obstruction.\(^1\)\(^2\) Endoscopic retrograde cholangiography (ERC) and percutaneous transhepatic cholangiography (PTC) are considered the gold standards for biliary tract evaluation, but they have their own complications and limitations.\(^1\)\(^3\)\(^-\)\(^4\) Magnetic resonance cholangiography (MRC) is emerging as a noninvasive method for biliary tract evaluation. A prospective study was performed to analyze the accuracy of MRC in the diagnosis of BC in a consecutive series of OLT recipients.

MATERIALS AND METHODS

From 2000 to 2002, 21 consecutive OLT recipients were referred for routine follow-up MRC within 1 year after the procedure. All patients with an abnormal MRC (n = 8) or elevate serum alkaline phosphatase level (n = 5) underwent ERC or surgical exploration. Patients with a normal MRC and serum alkaline phosphatase level (n = 8) were considered true-negative cases based on at least 1 year of uneventful clinical and biochemical follow-up.
Seventeen patients had undergone a duct-to-duct anastomosis; 4 had a biliary-enteric anastomosis (Roux-en-Y choledochojejunostomy). The study group included 21 patients (14 male and 7 female) of age range 6 to 66 years (mean age, 41 years). MRC was performed with a 1.0-T magnet (Magnetom Impact, Siemens Medical Systems, Erlangen, Germany), with a body phased-array coil. Patients did not fast prior to the examination. Half-Fourier acquisition single-shot turbo spin-echo (HASTE) sequences were acquired in all patients. Prior to MRC, the biliary tract was localized with a thick-slab HASTE study in the axial and coronal oblique planes. A thin-section (5-mm) multislice HASTE sequence was then obtained in the coronal oblique plane, parallel to the long axis of the extra-hepatic bile duct, in a single breath-hold. Images were later processed on a magnetic resonance (MR) workstation using a maximum intensity projection (MIP) algorithm. Both the MIP reconstructions and the source images were subsequently analyzed.

An experienced abdominal radiologist who was blinded to all clinical and laboratory findings interpreted the MR cholangiograms. A second examiner reviewed the cholangiographic findings from MR cholangiograms and ERC/surgery. The examiners compared findings interpreted the MR cholangiograms and ERC/surgery. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of MRCP for the detection of BC were calculated.

### RESULTS

MRC detected BC in 8 patients (38%), all of whom had primary duct-to-duct biliary reconstructions. There were 8 biliary anastomotic strictures of which 2 had upstream dilatations. Three of these patients underwent surgery with conversion to a Roux-en-Y choledochojunostomy 5 were managed with endoscopic balloon dilation. Compared with the findings at ERC, surgery, or clinical/laboratory follow-up, MRC had 87.5% sensitivity, 92.3% specificity, 87.5% positive predictive value, and 92.3% negative predictive value, with an overall accuracy of 90.4% in the detection of BC (Table 1).

#### DISCUSSION

Our results confirm recent studies that have demonstrated MRC to be accurate for the detection of BC in OLT patients. The recent literature in OLT surgery favors the use of choledocho-choledochostomy without a T-tube as the preferred technique of biliary reconstruction. However, due to the absence of the tube, one disadvantage is the lack of direct access for cholangiographic studies. Patients with a primary choledochojunostomy also have impaired access for endoscopic studies. Although ERC and percutaneous transhepatic cholangiography provide detailed images of the biliary tree that allow therapeutic intervention, 3% to 5% of procedures are associated with complications.

### REFERENCES

5. O’Connor TP, Lewis WD, Jenkins RL: Arch Surg 130:312, 1995