21 Biliary Complications After Orthotopic Liver Transplantation: Imaging and Intervention

J.M. LLERENA and W.R. CASTAÑEDA-ZUNIGA

CONTENTS
21.1 Introduction ........................................... 271
21.1.1 Indications for Liver Transplantation ........... 271
21.1.2 Pretransplantation Noninvasive and Invasive Imaging Evaluation ......................... 271
21.1.3 Surgical Anatomy in Liver Transplantation .... 272
21.2 Biliary Complications .............................. 272
21.2.1 Biliary Strictures .................................. 273
21.2.2 Biliary Leaks ...................................... 274
21.2.3 Miscellaneous Biliary Complications ......... 277
21.3 Summary ................................ 277
References ......................................................... 277

21.1 Introduction

Orthotopic liver transplantation is now an accepted and successful mode of treatment for patients with various forms of end-stage liver disease. Graft survival has improved significantly in the last decade, with a 5-year survival estimated at 65%–78% (BELLE et al. 1993). As hepatic transplantation has become more common and successful, radiologists have been challenged not only with the early diagnosis of graft dysfunction, but also with the treatment of complications using interventional radiologic techniques. We will discuss the role of the noninvasive and invasive imaging techniques in the detection and management of biliary complications after orthotopic hepatic transplantation.

21.1.1 Indications for Liver Transplantation

The accepted indications for liver transplantation have not changed significantly in recent years. Among children, biliary atresia (52%) remains the most common indication for hepatic transplantation, followed by acute fulminant hepatic failure (11%), α1-antitrypsin deficiency (9%), cryptogenic cirrhosis (6%), and others (22%) (WESTRA et al. 1993). Among adults, cirrhosis (60%) as an indication is followed by primary cholestatic liver disease (22%), fulminant hepatic failure (6%), hepatic malignancy (5%), and others (7%) (BELLE et al. 1994).

21.1.2 Pretransplantation Noninvasive and Invasive Imaging Evaluation

A detailed discussion of the role of noninvasive and invasive imaging modalities before liver transplantation is beyond the scope of this chapter. However, it is important to remember the key information with which the radiologist has to provide the surgeon prior to surgical intervention which includes a calculation of the liver volume, an evaluation of the size and patency of the portal vein, superior mesenteric vein, hepatic veins, hepatic artery, inferior vena cava (IVC), and portosystemic shunts, and an anatomical evaluation after checking for liver masses and extrahepatic disease.

Although there is no single ideal imaging technique for the preoperative evaluation of liver transplant candidates, a recent review by REDVANLY et al. (1995) has recommended computed tomography (CT) as the primary and most cost-effective imaging modality for the preoperative evaluation of these patients. Dynamic bolus CT, preferably with spiral technique, has proven to be a good technique to calculate liver volumes and to evaluate for liver masses and extrahepatic disease. CT is also adequate for evaluating the vascular anatomy, especially when three-dimensional data is reformatted as a CT angiogram. In this context, other imaging modalities, such as color Doppler ultrasonography, magnetic resonance imaging, angiography, and percutaneous transhepatic cholangiography, may be used only as secondary targeted examinations for solving specific questions not answered by CT.
21.1.3 Surgical Anatomy in Liver Transplantation

Surgical techniques have been reviewed by Lerut et al. (1988) in 393 consecutive grafts. In routine orthotopic hepatic transplantation, the donor liver is placed within the recipient's hepatic fossa and five end-to-end anastomoses are performed: four vascular anastomoses (hepatic artery, extrahepatic portal vein, suprahepatic and infrahepatic IVC) and one biliary anastomosis.

The hepatic artery anastomosis in adults frequently uses a Carrel patch (donor celiac axis with small aortic patch) anastomosed end-to-end with the recipient hepatic or celiac arteries. On the other hand, children usually undergo end-to-end anastomoses between the donor and recipient hepatic or celiac vessels. Alternatively, a donor iliac artery is anastomosed inferiorly to the recipient infrarenal aorta and superiorly to the donor Carrel patch. In donor livers with dual blood supply, a single donor vessel is created prior to anastomosis with the recipient hepatic or celiac arteries.

Revascularization of the portal vein and IVC is routinely performed with end-to-end anastomoses between the donor and recipient vessels. In patients with recipient portal vein thrombosis, a donor common iliac vein is anastomosed inferiorly to the recipient infrapancreatic superior mesenteric vein and superiorly to the donor extrahepatic portal vein. Patients with large discrepancy between the donor and recipient IVC require an end-to-side (piggy-back) caval anastomosis.

The routine biliary anastomosis in adult transplantation is an end-to-end choledocho-choledochostomy, stented externally with a T-tube for 2–3 months. Adults with diseased extrahepatic biliary ducts and pediatric patients routinely undergo end-to-end choledocho-jejunostomy using a Roux-en-Y with internal stenting. A choledocho-cholecysto-choledochostomy has been used only in Europe with variable results (Evans et al. 1990).

21.2 Biliary Complications

Biliary complications remain a major cause of morbidity and mortality in liver transplant recipients. The largest series in the literature show biliary tree complications occurring in 13%–25% of patients (Kuo et al. 1994; Peclet et al. 1994; Pariente et al. 1991; Letourneau and Castañeda-Zúñiga 1990). Leak is the most common biliary complication during the first weeks after transplantation; on the other