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## Percutaneous Transhepatic Cholangiography Rather Than Ultrasound as a Screening Test for Postoperative Biliary Complications in Liver Transplant Patients

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**D**IAGNOSTIC IMAGING of the biliary tract is often required in liver transplant patients with suspected biliary complications.<sup>1,2</sup> Direct cholangiography, either percutaneous transhepatic (PTC) or endoscopic retrograde, is the definitive radiological examination for the detection of biliary abnormalities.<sup>3</sup> Ultrasound (US) is noninvasive and accurate in detecting dilatation of the biliary tree. On the basis of experience in nontransplant patients, US has traditionally been considered the screening examination of choice for detecting bile duct obstruction.<sup>4,5</sup>

Because liver allograft recipients undergo close postoperative laboratory monitoring, elevation of liver enzyme levels is often the first manifestation of a biliary complication. Because transplant patients typically undergo imaging evaluation early and because certain allograft biliary complications are not necessarily accompanied by ductal enlargement, bile duct dilatation is often not seen. In this study, we review the results of US examinations performed in 50 transplant patients with biliary complications diagnosed by PTC. Data are presented that show that US is insensitive as a screening test in the early detection of biliary complications in liver allograft recipients.

### SUBJECTS AND METHODS

During the 75-month period ending March 31, 1987, 800 patients received 1,045 orthotopic liver transplants.

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Biliary complications were diagnosed by PTC in 71 patients. US examinations were available in 50 of the 71 patients. PTC followed the US examination within three days in 35 patients, four to seven days in six patients, and eight to 15 days in nine patients.

PTC was performed from a right lateral intercostal approach with a 22-gauge needle. Real-time sonographic evaluation was performed on Advanced Technology Laboratories' MK 300 (Bothwell, WA) and Acuson 128 scanners (Mountain View, CA). The presence of intrahepatic bile duct dilatation, a common duct diameter greater than 7 mm, an intrahepatic or subhepatic fluid collection, or an intraductal stone constituted an abnormal, or positive, US study.

### RESULTS

Biliary complications were diagnosed by PTC in 50 patients. Complications included anastomotic and nonanastomotic strictures, bile leaks, stones, bile duct redundancy, cystic duct abscess, and obstructed internal biliary stents (Table 1). The results of US examination were abnormal (Table 1) in 23 of the 50 patients (sensitivity, 46%). In 20 of the 23 cases, US findings were abnormal because of bile duct dilatation. In 27 patients with abnormal PTC results (Figs 1 and 2), no abnormality was demonstrated on US.

**Table 1. Results of US-Examinations in Liver Transplants With Biliary Complications Diagnosed by PTC**

| Biliary Complication (n)    | US-Positive | US-Negative |
|-----------------------------|-------------|-------------|
| Strictures (32)             | 17*         | 15          |
| Bile leak (4)               | 1           | 3           |
| Stones (2)                  | 1           | 1           |
| Common duct redundancy (4)  | 1*          | 3           |
| Cystic duct abscess (1)     | 1           | 0           |
| Occluded internal stent (7) | 2*          | 5           |
| Total (50)                  | 23†         | 27          |

\*US-positive because of bile duct dilatation.

†Sensitivity of ultrasound, 46%.

**Fig 1. Transhepatic cholangiogram performed because of elevated liver enzyme levels demonstrates an irregular stricture of the allograft common hepatic duct (arrows) with a nondilated biliary tree. A US study was normal; the hepatic artery was patent by pulsed Doppler examination. The etiology of the stricture was unknown.**



**DISCUSSION**

Biliary tract evaluation is often required in liver transplant patients with an abnormal postoperative course. Clinical manifestations of biliary complications in these patients may be nonspecific and include acute cholangitis, fever, septicemia, and elevation of liver enzyme levels.<sup>6</sup> In the nontransplant patient, earlier studies have shown that US is sensitive in detecting bile duct dilatation and therefore is a useful screening test for biliary obstruction.<sup>4,5</sup> However, US may fail to demonstrate dilated ducts because of biliary sludge, obscuration by bowel gas, and technically inadequate scans.<sup>3</sup> Also, in 9% of nontransplants with obstructive jaundice, bile duct dilatation is absent.<sup>7</sup> We have demonstrated that in liver transplant patients US has a much higher false-negative rate for detecting biliary complications, especially obstruction.

In screening liver transplants for biliary

complications, there are several reasons for the low sensitivity of US. Early detection of elevated liver enzyme levels permits the cholangiographic diagnosis of biliary strictures that have not been present for sufficient time to cause bile duct dilatation (Fig 1). This finding has been reported in nontransplant patients as well.<sup>7,8</sup>

Partial biliary obstruction, as seen with occluded internal biliary stents and some bile duct strictures, may not result in bile duct dilatation, thus leading to a negative US result. Sludge and bile encrustation that can narrow or occlude internal biliary stents cannot be seen with US. On US, internal biliary stents also cause acoustic shadowing, which does not permit evaluation of the stent lumen or common duct caliber. To diagnose stent occlusion, a common cause of biliary obstruction after Roux-en-Y choledochojejunostomy,<sup>6</sup> PTC is therefore required.

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Fig 2. Transhepatic cholangiogram performed because of fever demonstrates contrast extravasation from the distal common duct into the peritoneal cavity (arrows). The biliary tree is normal in size. On US, such bile leaks may mimic postoperative ascites.

Direct contrast opacification of the common duct is also usually necessary to demonstrate extrahepatic duct redundancy because bile duct dilatation may be absent. In addition, not only may it be impossible for US to demonstrate the common duct along its entire course, but the more distal duct can also be obscured by an overlying gas-filled bowel.

At our institution, if direct opacification of the biliary tree is required, PTC rather than endoscopic retrograde cholangiography is the preferred method for two reasons. First, many transplant patients undergo biliary recon-

struction by choledochojejunostomy in Roux-en-Y. In these patients, the only access to evaluate the biliary tree is a percutaneous transhepatic one. Second, if biliary obstruction is diagnosed by PTC, the preferred initial method of treatment is transhepatic catheter drainage. This procedure is a direct extension of transhepatic cholangiography.

Bile leaks after liver transplantation can result in a contained biloma that may be detectable by US. However, a biloma cannot be distinguished from other fluid collections such as loculated ascites, which occurs fre-

quently, seromas, or abscesses. In addition, small confined bile leaks may be obscured on US by adjacent bowel gas or acoustic shadowing from internal biliary stents. Free bile extravasation into the peritoneal cavity may lead to the US appearance of postoperative ascites. PTC readily demonstrates both loculated contrast extravasation into bilomas and free leakage into the peritoneal cavity (Fig 2).

In the immunosuppressed transplant pa-

tient, serious biliary complications are associated with a high mortality if they are not recognized and corrected promptly.<sup>9</sup> US is insensitive as a screening test for the early detection of biliary complications in liver allografts. We conclude that in liver transplant patients with suspected biliary complications PTC is the screening procedure of choice. PTC permits the diagnosis of a variety of posttransplant complications that frequently require early intervention.

#### REFERENCES

1. Zajko AB, Campbell WL, Bron KM, et al: AJR 144:127, 1985
2. Zajko AB, Bron KM, Campbell WL, et al: Gastrointest Radiol 12:137, 1987
3. Gold RP, Casarella WJ, Stern G, et al: Radiology 133:39, 1979
4. Neiman HL, Mintzer RA: AJR 129:979, 1977
5. Koenigsberg M, Wiener SN, Walzer A: Radiology 133:157, 1979
6. Lerut J, Gordon RD, Iwatsuki S, et al: Transplantation 43:47, 1987
7. Beinart C, Efremidis S, Cohen B, et al: JAMA 245:353, 1981
8. Ferrucci JT Jr, Adson MA, Mueller PR, et al: AJR 141:1, 1983
9. Starzl TE, Putnam CW, Hansbrough JF, et al: Surgery 81:212, 1977

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