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Biliary Tract Complications in Liver Transplantation Under Cyclosporin–Steroid Therapy

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Complications of bile duct reconstruction in liver transplantation are more frequent than those of vascular anastomoses.^{1,2} In earlier times, unrecognized bile duct obstruction was frequently mistaken for graft rejection, and unwise decisions to increase immunosuppression often resulted in fatal septic complications. In other cases, biliary leakage and peritonitis in the early postoperative period limited the adequate use of immunosuppression, resulting in acute graft rejection superimposed on serious septic biliary peritonitis.

The problems caused by biliary complications under conventional immunosuppression have been reported in our series¹ and in the Cambridge series.² These, directly or indirectly, caused death in many cases. In this article the incidence, nature and management of biliary complications after liver transplantation will be reported in patients under cyclosporin–steroid therapy.

Materials and Methods

Methods of Bile Duct Reconstruction

End-to-end choledocho-choledochostomy was the first choice of bile duct reconstruction whenever donor's and recipient's common bile ducts were adequate in size and quality. A T-tube was used as a stent through a small choledochotomy on the recipient's common bile duct when both the donor's and recipient's common bile ducts were large enough to accept at least a French no. 8 T-tube (choledocho-choledochostomy with T-tube stent, C-C-T). When the bile ducts were too small to accept a T-tube, or when choledochotomy was considered unwise, a straight tube (usually infant feeding tube) was used as a stent, one end passing through the papilla of Vater into the duodenum (choledocho-choledochostomy with straight tube stent, C-C-S).

End-to-side choledocho-jejunostomy in Roux-en-Y with a straight tube stent (C-J-S) became the first choice when the recipient's bile duct was absent (in biliary atresia) or diseased (in sclerosing cholangitis, bile duct cancer, or secondary biliary cirrhosis). When the donor's common bile duct was used for bile duct reconstruction, the gallbladder was always removed.

Cholecysto-jejunostomy in Roux-en-Y (Cy-J), tube cholecystostomy, or tube choledochostomy were used only when the operation was so difficult and the patient was so unstable that better bile duct reconstruction could not be performed.

Case Materials

During the 29 months between March 1980 and July 1982, 78 patients received 90 orthotopic liver transplantations under cyclosporin-steroid therapy. Of the 78 patients 30 were 5.5 months to 18 years old and 48 were adults (19–57 years). Three pediatric and 5 adult patients underwent liver transplantation twice, and two more pediatric patients were transplanted three times.

The indications for operation in 30 pediatric patients were: biliary atresia or hypoplasia (13 cases), alpha-1-antitrypsin deficiency disease (4), chronic aggressive hepatitis (3), Byler's disease (3), and 1 case each of secondary biliary cirrhosis, Budd-Chiari syndrome, neonatal hepatitis, Wilson's disease, tyrosinemia, type I glycogen storage disease, and Sea-Blue Histiocyte syndrome. Those for the 48 adult patients were chronic active hepatitis (15 cases), malignancy (9), primary biliary cirrhosis (8), sclerosing cholangitis (6), secondary biliary cirrhosis (4), alpha-1-antitrypsin deficiency disease (2), Budd-Chiari syndrome (2), adenomatosis (1), and alcoholic cirrhosis (1). Thus, 14 of 30 pediatric patients and 12 of 48 adult patients had absence of a primary disease of the extrahepatic biliary system.

Results

Choledocho-choledochostomy With T-Tube Stent

Choledocho-choledochostomy with T-tube stent (C-C-T) was used in 29 liver transplants (6 pediatric and 23 adult transplants). No complications related to bile duct reconstruction have developed in 24 (83%) of 29 transplants during the follow-up period. However, in 5 (17%), complications have developed. In two (OT 218, 237), a small leakage of dye from a T-tube insertion site was discovered by routine posttransplant cholangiography within 2 weeks. Despite the absence of clinical manifestation of bile leakage, the area was promptly drained by penrose drains through the previous right subcostal incision. The bile leakage ceased within a week.

In case OT 235, routine cholangiography revealed a significant leakage through the anastomosis. A small breakdown of choledocho-choledochostomy was repaired and the area was drained by penrose drains. A few days later, the repaired anastomosis broke down and a large amount of bile drained through penrose drains. The leak was finally controlled by excision of previous anastomosis and a new choledocho-choledochostomy with a T-tube stent. In case OT 221, routine posttransplant cholangiography did not reveal any leakage at 2 weeks, but 6 weeks after transplant the abdomen was explored for abdominal abscess. At that time, bile leak through a T-tube insertion site was found. Two months after drainage of abdominal abscess and control of bile leak, this patient was discharged with a granulating abdominal wound, but without bile leak. In case OT 230, routine cholangiography revealed that the proximal tip of T-tube was in the donor cystic duct instead of hepatic duct, causing a mild degree of biliary obstruction. The T-tube was replaced by a transhepatic biliary catheter. Two months later, the catheter was removed without any further biliary complications.

Choledocho-choledochostomy With Straight Tube Stent

Choledocho-choledochostomy with straight tube stent (C-C-S) was used in 22 transplants (10 pediatric and 12 adult transplants). Fifteen (68%) of the 22 C-C-S have been successful without complications, but 7 (32%) resulted in the following complications. In case OT 187, bile leak through the anastomosis was incidentally found during reexploration for postoperative hemorrhage within 24 hr after transplant. A straight tube stent was replaced by a T-tube inserted through the donor common bile duct, and the duct anastomosis was repaired. This patient died on the third day from graft failure due to poor preservation. In two cases (OT 194, 210) choledocho-choledochostomy broke down 5 days and 3 weeks

after transplant. Revision of choledocho-choledochostomy with T-tube in case OT 194 and a choledocho-jejunostomy in Roux-en-Y in case OT 210 have been successful for more than a year in the former and for 8 months in the latter. A large infarct and a breakdown of choledocho-choledochostomy occurred simultaneously in a pediatric recipient (OT 184) 17 days after transplant. The abdominal incision was left wide open for adequate drainage for 2 weeks and then the biliary system was reconstructed with hepaticojejunostomy in Roux-en-Y. This child has been well for almost 2 years after transplant with a large area of diffuse calcification in the central portion of the liver.

Biliary obstruction developed in two cases after C-C-S. In case OT 181, a straight tube stent could not be passed through the papilla of Vater. The tube remained within the bile duct and caused biliary obstruction. The tube was removed 10 months after transplant by choledochotomy. In case OT 193, the stent tube was passed out of the bile duct within 10 days after transplant. There was no immediate biliary complication, but biliary stricture at the anastomosis was documented by transhepatic cholangiography in the eighth posttransplant month. The obstruction was relieved by choledocho-jejunostomy in Roux-en-Y 5 months ago.

A fistula between the hepatic artery and the common bile duct developed in case OT 208 2 months after transplant with C-C-S. This rare complication was manifested initially by septicemia, and following intermittent massive upper gastrointestinal hemorrhage. Endoscopic examination did not reveal any source of hemorrhage except large amounts of blood clots. Angiography revealed an aneurysm of the hepatic artery, which suggested hemobilia as a cause of hemorrhage. An exploratory laparotomy disclosed blood clots in the bile duct and a mycotic aneurysm of the hepatic artery close to the choledocho-choledochostomy. The hepatic artery was resected and was replaced with an arterial homograft. One week later, the patient developed further massive hemorrhage and expired in the third posttransplant month.

Choledocho-jejunostomy in Roux-en-Y With Straight Tube Stent

Choledocho-jejunostomy in Roux-en-Y with straight tube stent (C-J-S) was used in 24 transplants (17 pediatric and 7 adult transplants). This method has been successful in 22 (92%) of 24 transplants during the follow-up period. However, complications have developed in two cases (8%). Bile leaked through partially broken choledocho-jejunostomy on the third posttransplant day in case OT 100. Revision of choledocho-jejunostomy at the new site had been without further complication until the death from recurrent bile duct carcinoma 9 months after transplant. In another case (OT 201), bile leak from the anastomosis was not recognized until 1 month after transplant when a small abscess at the hepatic hilum was suggested by a CT scan and a transhepatic cholangiography. An attempt to drain the small abscess and to reconstruct the biliary system resulted in a massive hemorrhage from the portal vein, and the child died during the operation on the 33rd posttransplant day.

Cholecysto-jejunostomy in Roux-en-Y

Bile duct reconstruction was compromised to cholecysto-jejunostomy (Cy-J) in 6 transplants (3 pediatric and 3 adult transplants). Five (83%) of 6 cholecysto-jejunostomies resulted in 3 cystic duct obstructions and one each of liver abscess and biliary abdominal sepsis. In two cases (OT 176, 190) the obstructions were at the cystic duct. In both cases the obstruction was relieved by choledocho-jejunostomy in the second posttransplant month without further biliary complication at least for a year. The obstruction in another case (OT 188) was caused by a ligature of donor distal common duct involving the entrance of the cystic duct. The obstruction was recognized on the seventh day and relieved by choledocho-jejunostomy.

However, this patient died from pulmonary sepsis and liver failure on the 23rd day. A large liver abscess developed in a pediatric case (OT 191) 2 weeks after transplant. This complication was successfully treated by a second liver transplant with choledocho-jejunostomy in Roux-en-Y 3 weeks after the first transplant. Pathologic examination of the first graft revealed a large fungal abscess with a communication to the right hepatic duct. This liver abscess could have been a result of poor organ preservation or of biliary duct obstruction. This child has been well without biliary complication more than a year after the second liver transplant. One patient died from a combination of unrecognized bile leak due to faulty ligature of the donor distal common duct, abdominal sepsis, and graft failure on the 12th day.

Others

Bile duct reconstruction was further compromised to tube cholecystostomy or choledochostomy in 4 transplants (1 pediatric and 3 adult transplants). One patient (OT 178) died on the second day before final bile duct reconstruction. A second patient (OT 220) required another liver transplant for graft failure 5 days after the first. A third patient (OT 294) underwent choledocho-jejunostomy in Roux-en-Y on the eighth day. This patient survived abdominal sepsis due to breakdown of the Roux-en-Y jejunojunction and other complications and is well without further biliary complications in the tenth posttransplant month. A fourth patient is recovering from abdominal sepsis with a tube cholecystostomy in the second transplant month.

Five patients died intraoperatively before bile duct reconstruction was achieved.

Discussion

Choledocho-choledochostomy is the ideal method of bile duct reconstruction, when feasible, because it is the simplest and most physiologic. Use of T-tube stent provides a protection of anastomosis from leakage and stricture as well as easy access to bile duct examination. Early recognition of subclinical bile leak and obstruction leads to proper prompt treatment and thus prevents the development of serious complications. None of the 29 patients so treated in the present series died with biliary complications. A straight tube internal stent was used in less satisfactory conditions of bile duct reconstructions. Probably because of this, bile leak and obstruction occurred more frequently with straight tube stent than with T-tube stent. However, only one patient (OT 208) with straight tube stent died with biliary complication.

Choledocho-jejunostomy in Roux-en-Y with a straight tube stent was used when recipient common bile duct was not available for duct-to-duct anastomosis. This method was applied on 17 pediatric recipients as small as a 5.5-month-old baby. Despite this, there were only two biliary complications, one of which was unfortunately fatal. This method of bile duct reconstruction is time consuming and requires microsurgical technique, particularly in pediatric transplants, but this is a sound alternative to duct-to-duct anastomosis.

Cholecysto-jejunostomy was used in the most adverse circumstances in the present series, usually as a means of quickly terminating the operation. Five complications ensued, of which four were treated successfully. Three patients lived at least 1 year without further biliary complications. Together with external tube drainage, cholecysto-jejunostomy can be used under adverse circumstances.

When the donor common duct was used for either choledocho-choledochostomy or choledocho-jejunostomy in Roux-en-Y, biliary complications occurred in 14 (19%) of 75 transplants under cyclosporin-steroid therapy. However, 12 of 14 complications were

treated successfully, and in only two patients were the biliary complications the direct or indirect cause of death (Table 1).

Acknowledgments

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References

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2. Calne RY, Williams R. *Curr Probl Surg* 1979;16:3.

Table 1
Primary Bile Duct Procedures and Complications

	Choledocho-choledochostomy With T-Tube (C-C-T)	Choledocho- choledochostomy With Internal Stent (C-C-S)	Choledocho- jejunostomy in Roux-en- Y With Stent (C-J-S)	Cholecysto-jejunostomy in Roux-en-Y (Cy-J)
Numbers	29	22	24	6
Success	24 (83%)	15 (68%)	22 (92%)	1 (17%)
Failure	5	7	2	5
Nature of failure				
Obstruction	1	2	0	4*
Bile leakage	4	4	2	1
Arterioductal fistula	0	1	0	0
Cause of death	0	1	1	1

* One patient developed a large fungal liver abscess, which led to retransplantation. He is doing well with the second liver graft 1 year later.