

# Liver transplantation for patients with hepatic alveolar echinococcosis in late stage

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**BACKGROUND:** Failed surgical treatment and multiple operations often lead to liver failure and make it difficult to be treated by traditional methods. Liver transplantation may be the ideal and the last choice. In this study we tried to explore the indication of liver transplantation for hepatic alveolar echinococcosis (HAE) and the improvement of intraoperative treatment.

**METHODS:** Five patients who had received liver transplantation of hepatic alveolar echinococcosis in our hospital from 1999 through 2003 were analyzed retrospectively.

**RESULTS:** All the patients (3 were male and 2 female) were in late stage of hepatic alveolar echinococcosis. During orthotopic liver transplantation (OLT), 4 patients underwent veno-venous bypass, 3 were subjected to veno-venous bypass prior to the mobilization of the liver, and 2 received placement of T tube in the bile duct. In all the patients treated successfully by OLT, 4 recovered, and 1 died of severe infection and acute rejection after operation. T tube fell off in one patient. Postoperatively, pathological diagnosis verified hepatic alveolar echinococcosis. Four patients were followed up to the present, showing a good life quality and work capacity.

**CONCLUSIONS:** Hepatic alveolar echinococcosis in late stage can be considered as one of the indications of liver transplantation. Technique of veno-venous bypass prior to the mobilization of the liver could decrease operative time and bleeding. Early diagnosis and treatment of the disease ensures a better prognosis.

(*Hepatobiliary Pancreat Dis Int* 2004; 3: 499-503)

**KEY WORDS:** hepatic alveolar echinococcosis;  
liver transplantation;  
indication; venous bypass

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## Introduction

Echinococcosis is a zoonosis caused by the larval stage of taenia echinococcus. Humans are the accidental intermediate host and animals are both intermediate and definitive hosts. Echinococcosis is widespread, and it is not confined to livestock countries. Increasing migration, high mobility of troops and a growing incidence of world travel make echinococcosis a global problem of increasing importance. However, it is common in livestock areas. In China, it is very common in Xinjiang, Qinghai, Tibet and Gansu provinces.<sup>[1-4]</sup>

Hepatic echinococcosis is divided into cystic liver echinococcosis and alveolar hepatic echinococcosis. The clinical features of liver hydatid disease depend on the site, size, stage of development, whether the cyst is alive or dead and whether the cyst is infected or not. The outstanding feature of a simple, uncomplicated hepatic hydatidosis, liver hydatid cyst is its clinical latency.<sup>[1]</sup> The hydatid produces few symptoms until complications occur. The manifestations of complicated hepatic hydatidosis result from pressure effect, rupture and bile duct communications. An enlarging liver cyst causes compressive atrophy of surrounding hepatocytes and fibrosis, thus leading to the obstruction of the bile duct and vessels, that is responsible for jaundice, cirrhosis, and portal hypertension, ascites and liver failure. Compression and displacement of biliary ducts are frequent.<sup>[1,5,6]</sup>

The decision to operate for liver hydatidosis depends on the condition of the patient and the cyst characteristics such as age, symptom, location of cyst, potential complications and so on.<sup>[7]</sup> The principles of operative management for hepatic hydatidosis include adequate exposure of the lesion, safe decompression and prevention of intraoperative contamination by active scoleces, neutralization and removal of the parasite, detection and management of the lesion-bile duct communication and management of the residual cavity.<sup>[8,9]</sup> Moreover, surgical procedures should be tailored to each patient for avoiding high surgical risk because of the benign nature of the disease.<sup>[10]</sup> However, failed surgical management of liver alveolar echinococcosis (AE) and multiple reoperations can lead to liver failure.<sup>[1,11]</sup> The patient needs to be operated by OLT procedures for survival and better life quality.

## Methods

### Patients

From January 1999 to December 2003, OLTs were performed in 5 patients with alveolar echinococcosis (3 men and 2 women) in late stage at our liver transplantation centre. These patients aged 16–58 years, with a mean age of 39.5 years. Four patients had been diagnosed operatively and by serum test prior to admission (Table 1).

### Indications

All the patients were in late stage of AE associated with jaundice, portal hypertension and liver failure. Lesions of 3 patients failed to be resected radically because of their close location to the porta hepatis and those of 2 patients for variably sized tumor foci in the liver.

### Previous operations and clinical course

Patient 1 was a man with a 5-year history of abdominal pain in the right upper quadrant and jaundice, who had been operated on twice, and T tube fell off from bile duct postoperation. Extrinsic compression of the vena cava and porta hepatis by liver AE of segments I, II, V and VI was confirmed by computed tomography and ultrasonography.

Patient 2 was referred to our department because of abdominal pain in the right upper quadrant and jaundice for two years. He had been treated surgically ten months ago and T tube fell off two months after the operation. Hepatic AE in segments II, V and VI sized 7.5 cm × 8.6 cm × 6.0 cm and contained the structure of the porta hepatis.

The clinical history of patient 3 included abdominal pain in the right upper quadrant and operative diagnosis operation eight months ago. The size of the lesion in the right liver lobe was 20 cm × 10 cm × 10.5 cm, with a low density. Liver function belonged to Child C grade.

Patient 4, female, 58 years old, was diagnosed by serum test prior to hospitalization with a history of abdominal pain, jaundice and ascites for ten years. Computed tomography showed multiple variably sized tumor foci in the liver with calcification and “budding” sign.

Patient 5 was a student with a history of abdominal pain in the right upper quadrant and swelling. She had no epidemiologic history but maintained the living habit. Computed tomography revealed diffuse variably sized foci in the liver with cirrhosis. In the same time, enlarged lymph nodes were seen in the peritoneal cavity.

In all patients immunological serum test showed positive results. Other information is shown in Tables 1, 2.

### Surgical technique and its improvement

In 5 OLT patients, 4 underwent conventional veno-venous bypass, 3 were given veno-venous bypass

prior to the mobilization of the liver, and 2 were placed with a T tube in the bile duct. The mean duration of surgery was 8.3 hours. During the dissection, surgical field was isolated in order to avoid the AE dissemination. The end-to-end anastomosis was made between the hepatic artery and hepatic artery, and between the bile duct and bile duct. The technique of bypass was improved using veno-venous bypass prior to the mobilization. First, the portal hepatis was mobilized, and then veno-venous bypass was performed. Finally, ligaments around the liver were cut.

## Results

Five OLTs were performed with a mean duration of surgery for 8.3 hours. One patient was operated on using conventional veno-venous bypass. Three patients underwent OLT using new techniques of veno-venous bypass prior to the mobilization of the liver, and two patients were placed with a T tube in the bile duct. End-to-end anastomosis was made between the hepatic artery and hepatic artery, so was the bile duct. Histological analysis of hepatectomy specimens disclosed AE lesions in 5 patients at the time of OLTs. One patient had liver cirrhosis, two had secondary biliary cirrhosis (SBC), and 1 sclerosing cholangitis (SC) (Table 2). Patient 2 who had T tube falling off during the previous operations for bile duct drainage, suffered from the same event after OLT in patient 3 with bile leakage.

The mean duration of hospital stay was 44 days. Patient 1 had a long stay because of slow healing, and patient 3 for complications and new operations. Four patients recovered completely in the postoperative period,

**Table 1.** Clinical data for patients with alveolar echinococcosis

OLT patient	Age (y)	Sex	Previous operation	Serum test	Extrahepatic AE
1	42	M	2	+	-
2	49	M	1	+	-
3	33	M	1	+	-
4	58	F	0	+	-
5	16	F	0	+	-

**Table 2.** Postoperative clinical data of OLT

OLT patient	T tube falling off	Veno-venous bypass	Hospitalization (d)	Follow-up (mon)	Liver pathology
1	-	+	79	27	AE/SBC
2	+	+	31	37	AE
3	leakage	+	59	24	AE/SBC
4	-	+	23	dead	AE/SC
5	-	-	28	21	AE/cirrhosis

SBC; secondary biliary cirrhosis; AE; alveolar echinococcosis; SC; sclerosing cholangitis.

one died of multiple organ failure (MOF) caused by severe infection including pneumonia, acute rejection and embolism of the liver artery on the tenth day of the postoperative period.

Four patients were followed up for 21 months to 37 months. Up to now, the quality of their life is pretty good. Patient 5 withdrew immunosuppressive agent two months after surgery.

## Discussion

The widespread echinococcosis is not confined to livestock countries. Increasing migration, high mobility of troops and a growing incidence of world travel make a global problem of increasing importance.<sup>[1]</sup> In the end of the AE stage, they lead to liver cirrhosis, portal hypertension and liver failure, named as terminal liver disease.<sup>[12,13]</sup>

It is relatively easy to diagnose hepatic AE by epidemiology and organ imaging, especially in those patients with definite history, multiple reoperations as well as positive serum test who need liver transplantation. Ultrasonography is a good choice for its convenience, lower cost, and nicety.<sup>[14,15]</sup> Intraoperative ultrasonography has been thought to be beneficial to find centrally localized lesion.<sup>[16]</sup> Computed tomography can provide more parameters for recognizing the characteristics of lesions and for selecting operative methods.<sup>[17]</sup> Magnetic resonance imaging (MRI) seems to be less effective than computed tomography making a positive diagnosis, because of its inability to show microcalcifications. In addition, MRI may not reveal small lesions. Experience with MRI demonstrates that features of this disease are limited.<sup>[18]</sup>

In 1994, Moreno<sup>[11]</sup> reported OLTs for 5 patients with hepatic AE in late stage with terminal liver disease, of whom 2 had secondary sclerosing cholangitis, 2 biliary sclerosis, and 1 postnecrotic liver cirrhosis. One patient died from hypertensive cerebrovascular accident in the postoperative period and four achieved a prolonged survival. In 2003, a multicenter study<sup>[19]</sup> performed by a European group of clinicians showed a 5-year survival rate of 71%, and a 5-year without-recurrence-survival rate of 58%. Major technical difficulties related either to previous laparotomies or loco-regional involvement were observed. The nine early deaths were due to a long past-history of symptomatic AE (iterative cholangitis, secondary biliary cirrhosis) in AE patients. Five late deaths were directly related to ongoing AE, located in the brain in three cases, a very rare AE location that was not investigated before LT in these patients. From January 1999 to December 2003, we treated hepatic AE in late stage by using OLTs and improved operative technique. In 2002, we reported two successful cases.<sup>[20]</sup> Up to now, 5 OLTs have been successfully performed in 5 patients, of whom 4 patients achieved a prolonged survival, and 1 died of severe postoperative complications.

Hepatic AE in late stage fails to be radically operated because of its multiple rupture, its involvement, its location close to the portal hepatis.<sup>[21]</sup> Failed surgical management and multiple reoperations always cause complications such as jaundice, portal hypertension, ascites and metastasis to the lung and brain.<sup>[22]</sup> The jaundice is not only due to the pressure effects, but also to the bile duct communications through which toxic agents such as formalin, and 20% sodium chloride enter the biliary tract to induce caustic sclerosing cholangitis (CSC) during the previous operative period. Several differences exist between caustic and primary sclerosing cholangitis (PSC). PSC has a relatively slow progression compared to the earlier onset of symptoms and rapid progression seen in secondary sclerosing cholangitis. Proximal ductal dilatation is rarely present in primary sclerosing cholangitis, but always present in CSC. Diffuse strictures are seen in PSC, while in CSC only parts of the biliary tree are affected. Finally, the presentation of the stricture is clearly related to the operation, and diseases associated with PSC are absent. CSC is very common, but it is not always regarded.<sup>[23]</sup>

Clinical practice showed that the poor postoperative prognosis of hepatic AE is related to CSC besides its progression. The morbidity of bile duct communication varies from 6.1% to 20.9%.<sup>[24,25]</sup> In fact, in 1987, Russo reported sclerosing cholangitis caused by formalin.<sup>[26]</sup> Also, we found that T tube tends to leave out from the bile duct to cause bile leakage and jaundice, presumably because of the poor elasticity of the bile duct caused by CSC. In our series, two patients complained of the T tube problem, which is related to the previous operations. More postoperative biliary complications were observed in OLTs for hepatic AE in late stage. One patient had bile leakage, and another one had a T tube falling off. In seven reported cases of CSCs, no biliary stricture was detected on intraoperative cholangiography, but bile duct stricture was found by cholangiography two to five months after operation.<sup>[27]</sup> Because of the above causes, OLT is useful and feasible in the treatment of hepatic AE in late stage. Moreover, in the patients with hepatic hydatidosis which is difficult to be resected or radically ablated, OLT should be performed as early as possible in order to improve the prognosis and to decrease the mortality. Preventing the bile duct from being causticized and avoiding multiple reoperations are also advisable to such patients.<sup>[28]</sup> Patient 5 of our series was a young woman who had had no operation ever before. Because of diffuse variably sized foci in the liver with cirrhosis, she underwent OLT with a good recovery. Her hospital stay was only 28 days.

It is important to decrease intraoperative bleeding, injury and duration of surgery when there are dense adhesions around the liver because of multiple reoperations and inflammation in late stage hepatic AE.<sup>[29]</sup> In our practice, we carried out OLTs using the new technique

of veno-venous bypass prior to the mobilization of the liver. First, the individual structures of the hilum including the common bile duct were skeletonized. The hepatic artery and common duct are ligated as near to the liver as possible. Mobilization of the hepatic artery facilitates the exposure of the proximal portal vein. The suprapancreatic extra-hepatic portal vein is completely free. Then the veno-venous bypass is initiated. With the hemodynamic stability afforded by veno-venous bypass, all other structures which hold the liver in place are systematically divided. The triangular ligaments and the leaves of peritoneal reflection which make up the coronary ligament are cut. The bare areas are entered on both the right and left sides. Second, the inferior vena cava is encircled and clamped. The technique is beneficial to reduce intraoperative bleeding and complications, to improve prognosis, especially in severe patients and those with dense adhesions around the liver. Retrospective analysis showed that compared to the conventional bypass, the technique which made it easy to remove the liver is feasible and advantageous.<sup>[30]</sup> In the past, however, the transplantation procedure of hepatic AE was more difficult than usual, postoperative complications were frequent. Most patients had a long hospital stay because of complications and new operations.<sup>[11,19]</sup> In our series, we used the new technique in three patients whose outcome was similar to that of patients with cirrhotic terminal liver diseases. Our results are better than those reported previously.<sup>[11]</sup>

In conclusion, hepatic AE in the late stage is one of the indications for liver transplantation. The technique of veno-venous bypass prior to the mobilization of the liver could decrease operative time and bleeding. After the improvement of operative techniques, OLT may be safe. Early diagnosis and treatment of hepatic AE ensures a better prognosis.

### Competing interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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*Received May 24, 2004*

*Accepted after revision August 20, 2004*