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Case Report

Clinical analysis of liver transplantation for benign liver tumor

Lian-Jiang Wang, Zi-Rong Liu, Ya-Min Zhang, Hong Zheng, Cheng Pan, Yong-Lin Deng, Zhong-Yang Shen

Department of Organ Transplant Center, First Central Hospital, Tianjin 300192, China

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Abstract: Aim: The study aimed to investigate the indications and results of liver transplantation for benign liver tumor. Methods: From January 2001 to December 2014, 16 patients (8 males and 8 females) with benign liver tumors were subjects of liver transplantation in our department. The surgical procedure, perioperative complications, postoperative management, and follow-up results were analyzed. Results: Two patients died in the perioperative period, and the remaining patients were discharged with proper perioperative liver and kidney function. All 14 of these patients have survived to date with an absence of abdominal symptoms, improved nutritional status, and normal work and social activities. Within the follow-up time frame of 17 to 161 months, the longest postoperative patient survival is now over 13 years. Conclusions: Transplantation is an effective and sometimes the only treatment option for unresectable benign liver lesions, especially for patients with severely handicapping hepatomegaly, but the shortage of donors remains an important factor to consider.

Keywords: Liver, benign tumor, liver transplantation, clinical analysis, unresectable

Introduction

A benign liver tumor rarely needs a liver transplant as the vast majority respond to conservative treatment or liver resection surgery. However, when the tumor cannot be removed because of widespread growth and it endangers the patient's life, a liver transplant is needed, and may be the only choice. There has been very little reported on benign liver tumor transplantation cases either domestically or overseas. From 2001 to 2014, a total of 16 cases of benign liver tumor patients underwent liver transplantation in Tianjin First Central Hospital; their indications and efficacy are analyzed and summarized in this report.

Materials and methods

General data

16 patients with a mean age of 48.2±13.2 years old, 8 male, 8 female were studied. There were 12 patients with polycystic liver, including the merger of 6 with polycystic kidney disease, 2 with hepatic epithelioid hemangioendothelioma, 1 with hepatic cavernous hemangioma, and 1 with liver hamartoma. Patients presented liver enlargement as the main symptom. This enlargement caused severe abdominal discomfort along with fatigue, anorexia, dyspnea, orabdominal bleeding. All of these symptoms seriously affected quality of life and affected liver function. Nine patients had previously undergone surgery with poor results and consequently chose liver transplantation (**Table 1**).

Surgical methods

Donor surgery uses multiple organ perfusion in situ combined with the rapid cutting method of the abdominal aorta and superior mesenteric venous catheter, HCA and UW solution for fast lavage, en bloc resection of liver and kidneys, and routine dressing of donor liver and kidney. A living donor liver (right half liver with hepatic vein) was used in 1 patient, and the remaining 15 patients received cadaveric donations, including 14 patients receiving a whole liver transplantation and 1 transplantation using a cadaveric split-type right liver. Classical orthotopic liver transplantation was performed in all 16 patients, including 5 patients who presented with polycystic liver and polycystic kidney combined with a renal transplant.

Postoperative management

After surgery, patient heart, lung, liver, and kidney function and blood coagulation were moni-

Table 1. Characteristics of Patients

Case	Sex	Age	Diagnosis	Preoperative treatment
1	Female	47	Polycystic liver	Cyst fenestration
2	Male	40	Polycystic liver	Aspiration and sclerotherapy
3	Female	53	Polycystic liver	None
4	Female	21	Polycystic liver and kidney	Liver resection
5	Male	63	Polycystic liver and kidney	Liver resection and kidney transplantation
6	Female	53	Polycystic liver and kidney	Aspiration and sclerotherapy
7	Female	57	Polycystic liver	Cyst fenestration
8	Male	22	Hepatic epithelioid hemangioendothelioma	Cyst fenestration
9	Male	62	Polycystic liver	Aspiration and sclerotherapy
10	Male	42	Polycystic liver	Cyst fenestration
11	Male	61	Hepatic epithelioid hemangioendothelioma	None
12	Male	52	Polycystic liver and kidney	None
13	Male	59	Polycystic liver and kidney	None
14	Female	54	Hepatic cavernous hemangioma	Exploratory laparotomy and interventional embolization
15	Female	34	Liver hamartoma	None
16	Female	51	Polycystic liver and kidney	Liver resection, aspiration, and sclerotherapy

tored. Body fluids and acid base balance were maintained according to blood pressure, central venous pressure, heart rate, and intake and output volume. Early postoperative daily abdominal ultrasound examination, regular chest X-ray and CT examination were part of the postoperative management. An immunosuppressive regimen was followed which included treating with daclizumab (Zenapax) or basilximab (Simulect) abduction and a sequential therapy of hormone, while adding a combination therapy of mycophenolate mofetil (MMF) and FK506. The blood concentration of FK506 was monitored regularly and the dosage adjusted accordingly. Broad-spectrum antibiotics were injected as part of the postoperative routine to prevent infection and ganciclovir was administered to prevent cytomegalovirus infection.

Result

Perioperative period

One patient with polycystic liver due to primary liver reactive failure required that the liver first be resected and the portal vein and inferior vena cava anastomosed for portacaval bypass to wait for donor liver. After 16 hours, the liver was transplanted again, and when the portal vein opened, the patient's blood pressure drop sharply and the patient died from cardiac arrest. In one split liver transplantation, patient ventricular fibrillation emerged after the artery was opened and, although rescue restored sinus rhythm, the patient died in the second day due to bleeding and prolonged shock. The remaining 14 cases were successful with anaverage operation time of 7.1±2.5 hours.

Follow-up and prognosis

There were 2 cases of perioperative death, with the remaining 14 patients discharged with normal perioperative liver and kidney function. Patients were followed for a period of 17 to 161 months. One patient had a mild rejection response six months postoperatively and recovered after hormone therapy treatment. One patient with a combined liver and kidney transplant had delayed renal function recovery due to early postoperative oliguria. However, renal function gradually returned to normal after auxiliary hemodialysis. One patient with mild biliary anastomotic stricture recovered after the placement of a biliary stent. All the patients have survived to date with the longest postoperative survival at more than 13 years at the time of this report. All patients report that their abdominal symptoms have disappeared, their nutritional status is significantly improved, and they can function normally in work or social activities. Surgery and prognosis details are shown in **Table 2**.

Discussion

With the continuous progress of imaging technology, more and more benign liver tumors are detected in the general population. In cases

Table 2. Surgery and prognosis

Case	Operation method	Donor species	Amount of Bleeding	Immunosuppressive regimen	Prognosis
1	Classical unbypass orthotopic liver transplantation	Cadaveric liver	1,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
2	Classical unbypass orthotopic liver transplantation	Cadavericliver	2,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
3	Classical unbypass orthotopic liver transplantation	Cadavericliver	1,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
4	Classical unbypass combined liver–kidney transplantation	Cadavericliver	1,500 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
5	Classical unbypass combined liver–kidney transplantation	Cadavericliver	3,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
6	Classical unbypass combined liver–kidney transplantation	Cadavericliver	4,500 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
7	Classical unbypass orthotopic liver transplantation	Cadavericliver	3,800 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
8	Living donor liver transplantation (right liver and middle hepatic vein)	Living donor liver	3,600 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
9	Classical unbypass combined liver–kidney transplantation	Cadavericliver	6,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
10	Classical unbypass orthotopic liver transplantation	Cadavericliver	2,100 ml	Tacrolimus, Mycophenolate mofetil and methylprednisolone	Survived
11	Split liver transplantation	Cadavericliver	5,600 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Died in day 2
12	Classical unbypass combined liver–kidney transplantation	Cadavericliver	2,500 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
13	Classical unbypass orthotopic liver transplantation	Cadavericliver	15,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Died during transplantation
14	Classical unbypass orthotopic liver transplantation	Cadavericliver	10,000 ml	Cyclosporin and myfortic	Survived
15	Classical unbypass orthotopic liver transplantation	Cadavericliver	5,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived
16	Classical unbypass orthotopic liver transplantation	Cadavericliver	12,000 ml	Tacrolimus, mycophenolate mofetil, and methylprednisolone	Survived

where complications occur or where the liver tumor's nature cannot be judged, resection surgery is the primary treatment option. At present, the number of liver transplantations is also gradually increasing for benign tumors with diffuse growth.

For benign liver tumors, although liver transplantation is the definitive curative treatment option, high complications often preclude that option and patients still have to face mortality. The two cases of perioperative deaths were in 2012 and were closely related to the shortage of donors and the subsequent lower quality of donor organ. There are no randomized clinical trials on the choices of benign tumor treatment including transplantation; most current reports are retrospective studies and the best standard treatment of these tumors is not yet clearly determined [1]. However, drawing on the analysis of this report's study cases, the long-term effect of liver transplantation is satisfactory with a lack of serious complications, leading to the conclusion that liver transplantation is a viable treatment for special cases of benign liver tumors. In this study, there are 6 kinds of benign liver tumors; polycystic liver and liver hemangiomas are the more commonly seen in the authors' clinic and the other four are more rare and their treatment methods are not the same.

The majority of the study group are polycystic liver disease patients, the most common indicator of benign tumor for liver transplantation [2]. Although aspiration, fenestration, and liver resection operations have better results on a single giant cyst or on polycystic liver disease with a lesion localized in one lobe, polycystic liver patients with diffuse growth should undergo liver transplantation [3]. In the studied group of 10 patients with polycystic liver disease, most liver function is normal or mildly abnormal, but due to the huge volume of liver, all 10 patients have obvious symptoms of oppression leading to restricted daily activities and a significant decline in the quality of life. Six patients among them had previous surgical treatment (aspiration and sclerotherapy, fenestration, and liver resection), but due to failure, they each selected liver transplantation. One patient died of primary hepatic reactive failure due to the use of a marginal donor. The rest of the polycystic liver patients survived with a good quality of life as of the date of this report.

In this group of patients, one presented with a giant hepatic hemangioma, the most common benign tumor of the liver with an autopsy and imaging diagnosis rate of 7% [4]. Liver transplantation in these cases is extremely rare. Because liver resection and interventional therapy had failed in this patient and the large tumor occupying the whole liver had produced serious compression symptoms, liver transplantation was carried out with a good prognosis. Most liver hemangiomas are treated conservatively. However, when there are indications for surgery, hemangioma decollement can maximize retention of liver parenchyma and can reduce complications, so it should be considered the preferred treatment [5, 6]. Liver transplantation has been performed in a very small number of giant hemangioma cases [7]. According to a retrospective study in the United States, 25 such patients received a liver transplant and their survival rates of 1, 3, and 5 years were 87.8%, 81.5%, 74.8% respectively.

In our hospital 2 patients with epithelioid hemangioendothelioma received liver transplantation. Epithelioid hemangioendothelioma is a rare type of soft tissue vascular tumor, which is between benign hemangioma and malignant angiosarcoma [8]. Although there are a few reports of untreated patients who are still alive, more than 50% of untreated patients have died. The curative effect of systemic and local chemotherapy and radiotherapy is not high. Liver resection is the preferred treatment for resectable cases and is recognized as the effective treatment, whether or not to cure radically, or whether there is an extrahepatic metastasis. Liver transplantation is the most common treatment option for the unresectable patients [9]. Long-term results are satisfactory, with a survival rate of 5 and 10 years at 83% and 74% respectively. Of our 2 patients, one with split liver transplantation surgery died the second day due to ventricular fibrillation. Another case has survived with a good quality of life to date.

Finally, one patient presented with liver hamartoma, a rare congenital liver benign tumor. Surgical resection is the most effective treatment and the choice of the specific procedure, including tumor local excision and rule hepatectomy and other options, was usually based on tumor size, number, location, the presence of

liver cirrhosis and the integrity of the liver capsule. If the tumor cannot be removed, liver transplantation has to be considered. Because the tumor in the patient in our clinic was huge and occupied the entire abdomen and pelvic cavity, the patient experienced severe compression symptoms combined with intracystic hemorrhage. In addition, we could not exclude the possibility of a malignant tendency, so liver transplantation was recommended and carried out. The patient is alive with good liver function.

In conclusion, liver transplantation indications usually include two causes. One is liver decompensation with various causes eventually leading to liver failure and threatening life. The other is the presence of malignant tumors, where liver transplantation can resect the lesions to the greatest extent, reducing the risk of recurrence. Liver transplantation cannot be the preferred treatment of benign liver tumors, mainly for economic reasons and due to donor shortage, but for unresectable and carefully selected cases, liver transplantation is an effective and sometimes the only treatment option.

Disclosure of conflict of interest

None.

Address correspondence to: Zhong-Yang Shen, Department of Organ Transplant Center, First Central Hospital, Tianjin 300192, China. E-mail: liuzirong0730@163.com

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