

# Asymptomatic process of hepatic artery thrombosis in a patient after orthotopic liver transplantation

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**BACKGROUND:** Hepatic artery thrombosis is one of the serious complications after liver transplantation. It will mostly cause a failure of the transplantation. This case of hepatic artery thrombosis showed a stable clinical course and minimal histological change, and now has been surviving for 4 years with normal liver function. We investigated the possible causes for asymptomatic hepatic artery thrombosis in one patient after orthotopic liver transplantation (OLT) and discussed the diagnosis of ischemia of OLT pathologically and clinically.

**METHODS:** Liver function test, color Doppler ultrasonography, and hepatic arteriography were performed during the development of hepatic arteriothrombosis. Possible factors for the asymptomatic process of the thrombosis were analyzed.

**RESULTS:** On the 4th postoperative day, thrombosis formed at the anastomotic stoma of the hepatic artery, and on the 11th postoperative day, the artery was completely occluded. Serial liver biopsies revealed intrahepatic cholestasis, hydropic degeneration of hepatocytes, atrophy of the biliary epithelium, and fibrosis in the portal area. Monitoring of liver function showed nothing abnormal except elevation of  $\gamma$ -GT and ALP levels. On the 71st day after OLT, arteriography demonstrated that the hepatic artery remained completely occluded in addition to the establishment of collateral circulation and compensation of the portal vein. The patient didn't show any symptoms of arterial thrombosis.

**CONCLUSION:** Collateral circulation and compensation of the portal vein are beneficial to allograft survival and avoidance of retransplantation after thrombosis of the hepatic artery. Color Doppler ultrasonography within 2 weeks after OLT is helpful to the early diagnosis of hepatic arterio-

thrombosis.

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**KEY WORDS:** liver transplantation; hepatic artery; embolism and thrombosis

## Introduction

Thrombosis of the hepatic artery, one of the serious complications after liver transplantation,<sup>[1-5]</sup> usually results in acute necrosis, multifocal abscess and some biliary complications.<sup>[6,7]</sup> Mostly, patients with this condition need a retransplantation.<sup>[8,9]</sup>

We report a male patient with hepatic artery thrombosis who has been surviving for 4 years. He had a stable clinical course and normal liver function. The possible causes for asymptomatic process of hepatic artery thrombosis were analyzed pathologically after we observed ischemia, necrosis and fibrosis in the liver. The diagnosis of ischemia caused by hepatic thrombosis was discussed.

## Case report

A 29-year-old man was subjected to liver transplantation because of liver cirrhosis and portal vein hypertension. After operation, the levels of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) decreased continuously and returned to normal after one week, but biliary secretion was kept in a low level (<50 ml/d) and direct bilirubin (DBIL), gamma-glutamyltransferase ( $\gamma$ -GT) and alkaline phosphatase (ALP) increased continuously. At the 4th postoperative day, T-tube arteriography showed that there was no sign of obstruction and the intrahepatic biliary trees were scarce. Color Doppler ultrasonography revealed that blood flow at the anastomosis stoma was normal with a little bit of thrombosis, but no stricture was found. Liver biopsy presented diffuse cold-preservation injury and cholestasis in liver cells and canals. Acute rejection was excluded. Because of insufficient biliary washing, physical saline as preservative

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fluid, and long-period of cold ischemia, intrahepatic cholestasis was considered. Ademetionine and prednisone (40 mg/d) were used for 26 days, bile excretion increased gradually and indirect bilirubin decreased continuously. On the 10th day after operation, color Doppler showed that thrombosis in the hepatic artery had formed and almost completely obstructed the lumen, and that the speed of blood flow decreased from 36 cm/s at 4 days after operation to 9 cm/s. During this period, however, the patient did not show any clinical symptoms of hepatic artery thrombosis, the level of hepatic enzyme was nearly normal, and the level of DBIL kept decreasing. Second operation was performed 11 days after the first one to remove the thrombus, which had extended into the right and left hepatic arteries to which the tube of extraction couldn't be inserted. The liver was normal in color, without any signs of necrosis on its surface. Histopathologically, cholestasis of hepatocytes and lobular bile ducts, and extended portal veins were noted except ischemia and acute rejection. During this period, the patient didn't have any clinical manifestations of obstruction of the hepatic artery, and the level of DBIL decreased to normal.

Thirty-four days after liver transplantation, liver biopsy showed amelioration of cholestasis, diffused hydropic degeneration of liver cells, decreased number of bile ducts, contracted biliary tract and slightly atrophied epithelial cells. After 71 days, no shade was observed by hepatic arteriography at the anastomosis stoma and terminal arteries. The contrast medium was fog-like around the stoma and portal area, but some small branches of the artery found inconspicuously converged into the liver at the diameter of 2 mm and diverged in it. The slightly extended portal vein showed a good configuration and the intrahepatic veins were dense and clear with the fast speed of development. Diffuse change in hepatocytes was more markedly than that of previous biopsy. Some of cells appeared to be balloon-like degenerated, showing extended spaces of the portal area with bridge-like connection and fibrosis associated with mucoid degeneration, normal number of bile ducts with a smaller diameter and atrophic epithelial cells. Some lymphocyte infiltrates were found in the portal areas and biliary epithelial cells. HBV test showed negative results. Pathological diagnosis included chronic ischemia of liver allograft, mild acute rejection, and mild to moderate fibrosis. One year after liver transplant, hepatic arteriography showed that a lot of anastomotic branches had formed and converged into the liver. The patient has been surviving for 4 years with good condition.

## Discussion

Clinically, arteriothrombosis is easily induced at the anastomosis stoma from donor's hepatic artery to recipient's

connective site of the gastroduodenal artery and hepatic proprietary artery because of its small diameter and slow speed of blood flow. In this patient, arteriothrombosis formed early and developed slowly, thus collateral circulation could be established adequately. Congenital malformation of blood vessel in donor liver was caused operatively, and there might be some anatomic variations of the intrahepatic vessels. After operation, the levels of DBIL,  $\gamma$ -GT and ALP increased continuously, but those of AST and ALT were nearly normal. The liver function of the patient recovered progressively and cholestasis disappeared after the treatment with cholagogues, suggesting that no correlation exists between intrahepatic cholestasis and hepatic arteriothrombosis. Chronic ischemia in hepatocytes and epithelial cells of biliary tubules could be seen in addition to fibrosis in the portal areas; but no extensive necrosis of liver cells and obstruction of biliary tubules was found. Specific clinical symptoms of hepatic arteriothrombosis did appear, and the course after operation was stable in this patient.

Hepatic artery is the only source of blood supply to the portal outer ducts, intrahepatic biliary ducts, portal connective tissues, lymph nodes and the wall of the portal vein. Oxygen supply to liver cells depends mainly on the hepatic artery.<sup>[10,11]</sup> As a result, the obstruction of the hepatic artery usually results in the destruction of these tissues.<sup>[12,13]</sup> The common clinical symptoms of hepatic arteriothrombosis are as follows: acute necrosis of hepatocytes associated with increased levels of hepatic enzymes and leukocytes, functional change of coagulation, positive results of blood culture for multi-alimentary bacteria and fungi, recurrent bacteremia with hepatic abscess, biliary duct complications, including biliary inflammation, contraction, necrosis and fistular formation, few patients asymptomatic with normal liver function or mild change, if any, because of partial compensation of the portal vein, but it is of individual difference.

Anatomically, there are some communicative branches between the hepatic artery and portal vein, and these branches are normally closed. When the hepatic artery is obstructed, the branches are open to let the portal vein irrigate the obstructed areas to lessen ischemia. Thus, the ability of compensation of the portal vein is dependent on the number of these branches. Further, the fate of allograft is up to the foundation of collateral circulation that is due to two premises: the onset time of thrombosis and the time from the onset of thrombosis to complete obstruction. With later onset and longer time from thrombosis to complete obstruction, the possibility of collateral circulation formation will increase and the allograft will survive. The establishment of collateral circulation and the compensation of the portal vein in this patient ensured survival of allograft and prevented retransplantation. But it is an occasional result of multiple beneficial factors. From this case, we conclude that early evidence of hepatic arteriothrombosis

should be found; clinical presentation and liver function test sometimes could not early detect hepatic arteriothrombosis; color Doppler ultrasound in 2 weeks after OLT is reliable for early diagnosis of hepatic arteriothrombosis; lysing embolus and interventional treatment should be taken timely to prevent the development of thrombosis, which would be advantageous for the establishment of collateral circulation; histological findings in liver biopsies could not serve as the evidence for the diagnosis of hepatic arteriothrombosis, but they are important for differential diagnosis. Observation on secondary changes caused by ischemia is helpful to the diagnosis of hepatic arteriothrombosis. For patients with hepatic arteriothrombosis presenting no symptoms but normal liver function, choleretics should be used to avoid retransplantation.

### 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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