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BRIEF REPORT

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Advantages of inferior vena caval flow preservation in combined transplantation of the liver and heart

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Abstract Only a few cases of combined liver and heart transplantation have been reported in the literature, and no standard surgical procedure has yet been established. We report the successful transplantation of both liver and heart in a 28-year-old patient suffering from homozygous beta-thalassemia. We used Belghiti's technique of inferior vena caval flow preservation for liver transplantation, which avoids inferior vena cava occlusion by a side-to-side caval anastomosis. Applied to combined liver and heart transplantation, preservation of caval flow during liver transplantation may allow early discontinuation of cardiopulmonary bypass and, thus, minimize the general consequences of prolonged bypass.

Key words Liver transplantation, heart transplantation, inferior vena cava flow · Heart transplantation, liver transplantation, inferior vena cava flow · Combined heart/liver transplantation, inferior vena cava flow · Vena cava inferior flow, combined heart/liver transplantation

Introduction

Nowadays, orthotopic heart transplantation (OHT) and orthotopic liver transplantation (OLT) are standardized and frequent procedures. However, simultaneous combined liver and heart transplantation (CLHT) constitutes a real surgical challenge. Since the first report of CLHT by Starzl et al. [5], only a few cases have been described in the literature, and no standard surgical procedure has been established. We report the case of a young patient suffering from homozygous beta-thalassemia who developed end-stage diseases of the liver and the heart and required CLHT. This procedure was performed with the technique of OLT described by Belghiti et al. [1], allowing early discontinuation of the bypass and minimizing the coagulopathy. The advantages of this technique in CLHT are discussed.

Case report

A 28-year-old male patient suffering from homozygous beta-thalassemia had been treated by weekly transfusions and subcutaneous deferoxamine since the age of 9 years. He underwent splenectomy in 1976 and laparoscopic cholecystectomy in 1992. In 1993, he developed cardiac failure; endomyocardial biopsy revealed heavy iron deposits and fibrosis. Despite medical therapy, the patient experienced several episodes of acute cardiac failure that required hospitalization for intravenous treatment. In May 1995, cardiac angiography demonstrated congestive cardiomyopathy with a left ventricular ejection fraction of 15%. Deterioration in hepatic function was evidenced by abnormalities in prothrombin time. Magnetic resonance imaging of the abdomen revealed moderate ascites and an enlarged liver with hepatic hemosiderosis. A liver biopsy showed heavy iron loading and portal fibrosis with patchy cirrhosis. CLHT was considered as the last therapeutic option for this young patient. On 25 November 1995, a compatible 20-year-old organ donor became available. Standard multiple organ harvesting was performed while the recipient was prepared in an adjacent operating room. The abdomen and thorax were opened through a midline incision extending from the manubrium to the pubis. Hepatic dissection was carried out after sternotomy. Stan-

dard cardiopulmonary bypass was then instituted with selective cannulation of both the superior and inferior vena cava and the ascending aorta. Standard OHT was then performed. The total ischemic time for the heart was 64 min. The patient was rewarmed, and once function of the new heart was satisfactory, bypass was discontinued and anticoagulation was reversed. Hepatectomy and liver transplantation were performed without IVC occlusion, according to the technique described by Belghiti et al. [1]. Portal vein clamping was well tolerated by the intestine, and venous bypass was not required. The side-to-side IVC anastomosis was performed without complications. The duration of the anhepatic phase was 31 min, and the total ischemic time for the liver was 184 min. The total operating time was 8.5 h.

The immediate postoperative course was uneventful, and the patient was transferred to a regular ward after having spent 3 days in the intensive care unit. The immunosuppression regimen consisted of triple drug therapy with cyclosporin, corticosteroids, and azathioprine. In addition, a course of antithymocyte globulin was given prophylactically in the early post-transplantation period. Corticosteroid administration was interrupted after 1 month because of the onset of infectious encephalitis. Nine months after the CLHT, the patient was asymptomatic, and his cardiac and hepatic functions were normal.

Discussion

There are very few indications for CLHT: CLHTs have been reported in patients suffering from familial hypercholesterolemia [4, 5], familial amyloidosis [3], or homozygous beta-thalassemia [2]. In homozygous beta-thalassemia, CLHT may be the only option for patients with end-stage, iron-induced, cardiac and liver disease, and it should be considered for any patient with iron loading and severe cardiac dysfunction associated with biopsy-proven cirrhosis [2].

No consensus has emerged regarding the ideal surgical procedure of CLHT. Shaw et al. [4] described the first three cases of CLHT in 1985. In these cases, cardiopulmonary bypass and portal vein decompression by portal drainage into the pump oxygenator were used during the liver transplantation. This prolonged bypass allowed the heart graft support and the reinjection of blood lost during the OLT. However, it may induce coagulopathy, which is worsened by the heparin required by the cardiopulmonary bypass. In the cases of Shaw et al., the coagulopathy took several hours to reverse. Since 1985, several techniques for recipient IVC preservation during OLT have been developed. The most famous of these is the "piggyback" procedure [6], which was modified by Belghiti et al. [1] in order to preserve the flow in the recipient IVC during OLT by a side-to-side IVC anastomosis using partial clamping of the anterior part of the recipient IVC. This IVC flow preservation reduces the indication of venous bypass in OLT if the recipient tolerates the partial IVC clamping test before hepatectomy, and it reduces the duration of the anhepatic phase because it requires only one caval anastomosis [1].

In our case of CHLT, we transplanted the liver with Belghiti's technique of OLT after discontining the cardiopulmonary bypass. The ischemic time for the heart graft was minimal and its function was immediately excellent, so that minimal inotropic support was required. The portal and caval clamping was well tolerated by the transplanted heart, even after the removal of the cardiopulmonary bypass. As a matter of fact, this heart graft function may be the limiting factor in the bypass removal in CLHT. In cases of prolonged ischemic time for the heart graft or of relative right heart insufficiency in the immediate post-OHT period, the partial IVC clamping may not be hemodynamically tolerated by the transplanted heart. The use of cardiopulmonary bypass as a cardiac support may then be useful in OLT if the recipient is unstable after OHT.

This case demonstrates that in CLHT, the technique of IVC flow preservation described by Belghiti and coworkers is feasible. It may allow the early discontinuation of the cardiopulmonary bypass, reducing the surgical time and the serious complications of prolonged bypass. However, the exact value and indications of this technique in CLHT should be evaluated by subsequent cases.

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