Variations of surgical reconstruction in liver transplantation depending on vasculature

Abstract

Background: From September 1988 through April 1998, 1000 liver transplantations were performed on 911 patients. The standard technique for liver re-vascularization to guarantee an optimal blood inflow during transplantation was modified in 19% of the cases on the arterial side and in 5.6% of the cases on the portal side as a result of unusual anatomical features and pathological changes in the vasculature of the organ recipient. In 113 transplantations, successful reconstruction of accessory vessels of the graft (12 left and 101 right hepatic arteries) was performed without complications. It is our opinion that preoperative diagnosis of the vasculature (stenoses of the celiac trunk etc.) of the organ recipient by duplexsonography and angiography is necessary. Even with the help of these tests, it is extremely difficult to diagnose a “steal” syndrome in the splenic artery: for example, 31 of 40 patients with poor liver function received postoperative therapy for newly diagnosed “steals”.

Results and conclusions: There is no increase in complications (stenosis and thrombosis) with modifications of arterial reconstruction (4.9 vs 6.3%); however, with modification of portal reconstruction the increase is from 2.4% to 8.3%.

Key words Liver transplantation · Vasculature · Blood flow · Organ failure

Introduction

The adequate reconstruction of afferent vessels is a precondition for successful liver transplantation. Poor blood inflow and technical problems often lead to early postoperative organ failure and graft loss. In this case, arterial complications prevail, as in 2–25% of early postoperative arterial occlusion cases (thrombosis) of which 50% of the affected patients are only treatable by re-transplantation [1, 2, 3]. Early portal vein occlusion is rare, occurring in 1–3% of transplantations [4].

The determination of the preoperative vascular status of both the organ recipient and the donor organ is necessary for optimal transplant re-vascularization due to the multitude of arterial variants and pathological changes in the afferent liver vasculature (thrombosis of the portal vein and recanalization, organic and functional arterial stenoses). In the literature to date, the necessity of a preoperative angiography for the organ recipient is subject to controversy. In situations where the patient is in poor preoperative physical condition (acute liver insufficiency with hypocoagulability), there is often no opportunity to administer the angiography.

The aim of the following study was to determine the vascular state of both the donor organ and the organ recipient and the consequences of reconstruction during transplantation in our own first 1000 liver transplanted patients.

Patients and methods

Between September 1988 and April 1998, 1000 liver transplantations on 911 patients were performed in Berlin. Eighty nine re-transplantations were necessary for 79 patients. The reasons for
re-transplantation were initially non-function of the graft in 20 patients, chronic rejections in 14, hepatitis B virus (HBV) re-infection in 14, acute liver artery thrombosis in 13, ischemic-type biliary lesions (ITBL) in 10, acute rejection in 6, hepatitis C virus (HCV) re-infection in 5, reoccurring Budd Chiari syndrome in 2, a vena cava occlusion in 2 and other causes in 3 patients.

Organ explantation was carried out by surgeons in other establishments (n=351) or by surgeons from our clinic using a standard technique of compressed perfusion (319 of 647). The patients were treated with different immunosuppressive regimens.

Results

Variations of vasculature in donor organs and organ recipients

Data concerning the vasculature of organ donors

Of the 1000 explantations performed, 984 were evaluated. In 237 cases (24%) the donor organ had arterial variations, which are shown in Table 1. Reconstruction of the accessory arteries was carried out in 113 donor livers (12 left and 101 right arteries). Distinction was not made if any pathological changes in the portal system were found.

Data concerning the vasculature of organ recipients

Arteries In 745 adult transplantations of the 1000 transplantations, an angiography of the splanchnic vasculature including a description of the portal system could be evaluated. These examinations were carried out partly in our radiology department or patients were diagnosed in external institutions. Relevant indications for modifying standard arterial reconstruction were stenosis of the celiac trunk (i and ii) as well as proof of a change in the portal system insertion of the arcuate ligament; in one patient, a “banding” of the splenic artery was performed to improve blood inflow.

Non-ligamentous or organic stenosis of the celiac trunk. Of the 74 cases of stenoses, 55 were classified as hemodynamically not relevant. In 25 cases following transplantation, an iliac graft to the aorta was implanted. In four cases, anastomosis was anchored directly to the aorta and in two cases to the splenic artery passage. In nine patients with a conventional anastomosis, adequate flow was achieved through splenectomy (n=1), “banding” (n=7) or ligation of the splenic artery (n=1). In the patients diagnosed with non-relevant stenosis, three had an iliac artery interposition to the aorta and on one anastomosis at the splenic artery insertion was performed.

Eight patients with stenoses of the celiac trunk were re-transplanted. Of those, three had a suprarenal iliac artery interposition on the aorta. One patient suffered an occlusion, another a stenosis and a third a kinking of the hepatic artery. The other five patients underwent conventional anastomosis at the time of transplantation. They all had an arterial occlusion of the transplant artery upon re-transplantation. Three of these patients also suffered from chronic extrahepatic biliary duct destruction. In all, there were five re-transplantations of those patients with ligamentous stenosis of the celiac artery, and in each of these cases a suspicion of artery occlusion was present on the duplexsonography, which was confirmed at re-transplantation. Two patients with relevant hemodynam-