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Successful liver transplantation from a donor with occlusive portal vein thrombosis

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Abstract

Introduction. *The shortage of donor organs has been and remains the basic problem of clinical transplantation and the expansion of the organ pool by using marginal donor organs has become one of its solutions. In this regard, every decision to use a "non-standard" or "non ideal" organ for transplantation should be made carefully.*

Aim. *Demonstration of successful liver transplantation from a donor with brain death and occlusive thrombosis of the splanchnic venous system.*

Description. *A 34-year-old donor without serious concomitant pathology was diagnosed with total portal thrombosis during liver procurement. After cold aortic perfusion, a thrombectomy from the portal vein was performed. At the “back-table” stage, an additional perfusion was made*

through the portal vein, the results of which confirmed the patency of the portal system. The liver graft was transplanted to a 33-year-old recipient; the postoperative period was uneventful, the patient was discharged on the 17th postoperative day.

Conclusions. *Portal vein thrombosis in a donor liver is rare. A positive decision on liver transplantation from a donor with portal vein thrombosis should be based on the confirmed patency of the portal system. It is desirable that these data be supplemented by a histological examination of the donor liver. The donor organs shortage needs to expand the criteria for post-mortem organ donation. However, every decision should be made in the light of individual characteristics of the donor-recipient pair.*

Keywords: liver transplantation, portal vein thrombosis, marginal graft, expanded criteria

Conflict of interests Authors declare no conflict of interest

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ALT, alanine aminotransferase

AST, aspartate aminotransferase

CVA, cerebrovascular accident

MLV, mechanical lung ventilation

Introduction

The shortage of donor organs has been and remains the basic problem of current clinical transplantology; and the expansion of the organ pool by using "marginal organs" has become one of its solutions

[1]. The use of "marginal" donor organs is always a dilemma, since, on the one hand, this is a significant risk of primary graft dysfunction; on the other hand, it is the risk of erroneously discarding a functionally sound organ, which in turn is nothing more than a missed opportunity to save a human life [2]. In this regard, each decision regarding the use of a “non-standard” or “non-ideal” organ for transplantation should be carefully weighed and justified [3].

The aim was to demonstrate successful liver transplantation from a brain-dead donor with occlusive thrombosis of the splanchnic venous system.

Clinical Case Report

The donor was a 34-year-old woman with brain death as a result of acute cerebrovascular accident (CVA) of the hemorrhagic type. She had a previous history of five vaccination procedures against coronavirus infection, influenza virus, encephalitis within 12 months preceding CVA occurrence. She stayed in the Intensive Care Unit for CVA for 2 days. Body mass index was 22.5 kg/m^2. There were no episodes of arterial hypotension, the parameters of biochemical and clinical blood tests were within the reference values.

Brief description of the donor stage of surgery

The donor surgery was performed by a multidisciplinary surgical team (hepatobiliary, cardiac surgery, and nephrotransplantation teams). During the abdominal organ revision, the doctors' attention was attracted by a marked pronounced plethora of the lesser omentum vessels; no other pathological signs in the abdominal cavity were detected at the time of the revision. On visual examination, the donor liver had normal dimensions, elasticity, a shiny capsule, sharp edges, and moderate signs

of fatty hepatosis. An excisional biopsy of the donor liver was performed; the biopsy specimen was sent for urgent histological examination. After a wide laparotomy and mobilization of the organs of the abdominal cavity and retroperitoneal space, cold perfusion with 15.0 liters of preservative solution was performed according to the standard method. At the end of cold perfusion, a homogeneous and uniform color of the donor liver was noted. In the process of dissection of the hepatoduodenal ligament elements, total thrombosis of the superior mesenteric and portal veins was revealed, which involved the intrahepatic branches. After transecting the portal vein, a dense mixed thrombus completely obturating the portal vein was removed from it. Visual examination of the portal vein showed thrombotic masses in the main trunk and lobar branches of the donor liver, which were easily removed (Fig. 1, 2). Further stages of the liver graft removal were uneventful. The urgent histological examination results demonstrated macrovesicular hepatosis up to 20%. During the "back-table" stage, additional perfusion was performed through the portal vein, and a satisfactory outflow of perfusate through the hepatic vein system was noted. Taking into account the encouraging data of an urgent biopsy and visual examination of the donor liver after cold perfusion, as well as the data indicating normal drainage of the portal system through the hepatic vein system, the decision was made at the intraoperative consultation to perform transplantation.

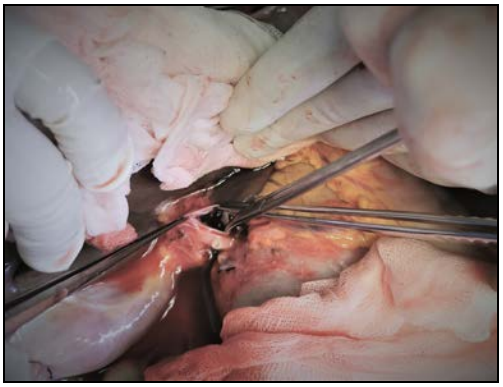

Fig. 1. Intraoperative photo of portal vein thrombosis diagnosed during the donor operation

Fig. 2. Intraoperative photo of the thrombus removed from the portal vein of the donor liver

Liver transplantation was performed in a 34-year-old woman suffering from cirrhosis resulted from chronic viral hepatitis B+D (Child-Pugh Class "C" scored 13). Hepatectomy was performed saving the retrohepatic inferior vena cava and followed by the caval, portal, arterial implantation and formation of a biliary-biliary anastomosis. The intra- and postoperative periods were uneventful; the peak of enzymemia was noted on the 1st day after surgery (See Table). At intraoperative Doppler ultrasound examination, the portal vasculature of the graft was patent, evenly filled. The control examination on the 7^{th} postoperative day

showed the portal vein of 1.2 cm in diameter, evenly filled; the linear blood flow velocity was 60 cm/sec.

Histology examination of thrombus from the portal vein yielded the results consistent with thrombus of certain time old, represented by hemolyzed and non-hemolyzed erythrocytes with an admixture of leukocytes, platelets, with layers of fibrin at some sites.

Twelve months after transplantation, the patient's condition was satisfactory, she was socially adapted and physically active.

Table. Some characteristics of the intra- and postoperative period

Parameter	Result
Surgery duration (min)	300
Cold graft ischemia time (min)	210
Warm ischemia time (min)	20
Intraoperative blood loss (mL)	500
Severe hemodynamic impairment prior to venous reperfusion	No
Severe hemodynamics impairment after venous reperfusion	No
Maximum AST/ALT values, (U/L)	384/301
Maximum bilirubin values (μmole)	55
AST/ALT values at discharge from hospital (U/L)	18/18
Bilirubin at discharge (μmole/L)	19.5
Bed day	17

Notes: ALT, alanine aminotransferase; AST, aspartate aminotransferase

Discussion

Despite the growing number of liver transplantations, mortality on the waiting list remains high and varies between 12–17.9 % [4]. The imbalance between the number of patients in need of transplantation and the actual number of effective donor organs has been the reason for the search for new solutions in expanding the organ pool. This challenge is only partly is coped with by the use of organs from expanded criteria donors, as well as related living donor transplantation programs for certain solid organs (e.g. kidney or a liver fragment). Thus, in the United

States, related living donor transplants account for more than 30%, and in South Korea, 76% of the total number of liver transplants [4, 5]. Nevertheless, in countries with a well-developed postmortem donation system, the way to expand the organ pool is most often realized through the use of marginal donor organs [6].

At the moment, there is no clear definition of the marginality of a donor liver, but in general, any allograft with an increased risk of its initial poor function is considered marginal [1]. Signs of marginality include, as a rule, the age of the donor over 65 years old, macrovesicular steatosis over 40%, a graft from a non-heart-beating donor, donor with body mass index over 30 kg/m^2, history of drug and alcohol abuse, stay in the intensive care unit and on mechanical ventilation (MLV) for more than 7 days, increased aminotransferases of more than 3-fold of normal, serum bilirubin level over 50 μmol/L, serum Na+ concentration of more than 165 mmol/L, positive serological study for viral hepatitis, cold ischemia time of > 14 hours, transplantation of a cadaveric liver fragment (split transplantation) [1, 2, 7]. The rate of discarding an extracted donor liver obtained from expanded criteria donors is at least 10% [4].

A liver graft obtained from a donor with total portal vein thrombosis should also be classified as a marginal organ due to presumed compromised perfusion through the portal venous system. It is likely that most transplant centers will discard such an organ. We managed to find three publications describing 4 cases of successful liver transplantation from donors with thrombosis of the portal venous system or even its complete absence. We have not come across such reports in Russian literature [8–10]. The causes of thrombosis in liver donors in two cases were splenectomy performed as a result of abdominal trauma [8]. In other cases, the possible cause of thrombosis was not reported. In our clinical case report, one of the probable causes of portal venous system

thrombosis could have been multiple vaccinations, especially considering that such cases have been described in literature [11, 12]. In this patient, portal thrombosis was the only but very significant sign of marginality, which required a very difficult decision to be made in a non-standard clinical situation. Only after making sure of the portal venous system patency after thrombectomy and focusing on the results of an urgent histological examination, a positive and, as it turned out, correct decision was made on liver transplantation.

Conclusions

In the light of the above data, let us focus on several points that may be useful to practicing transplantologists.

1. Thrombosis of the portal vein in a liver donor is a rare, but nonetheless occurring phenomenon. Given the mass vaccination of the population that took place as a result of several waves of the COVID-19 pandemic, such thrombosis cases are quite likely in the practice of organ donation services.

2. A positive decision to transplant a liver taken from a donor with portal vein thrombosis must be based on a confirmed patency of the portal venous system. It is advisable that these data be supplemented by a histological examination of the donor liver (in our center, this study is performed routinely).

3. The shortage of donor organs dictates the need to expand the criteria for post-mortem organ donation, however, each such decision should be made taking into account the individual characteristics of the donor-recipient pair. Transplantation of "marginal" organs implies the presence of well-coordinated work of surgical, anesthetic and resuscitation services with appropriate competencies.

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