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A CASE REPORT OF SUCCESSFUL LIVER RETRANSPLANTATION IN PATIENT WITH EARLY HEPATIC ARTERY THROMBOSIS COMPLICATED BY BILE DUCTS NECROSIS AND SEPSIS

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In this present case report during liver transplantation a patient was developed dissection of hepatic artery (HA) which was noticed after arterial reconstruction step. In one hour after surgery at intervention operating room stent placement of HA was performed. At early postoperative period by hepatic angiography study indicated for a second stent placement of HA, also embolization of splenic artery to treat a steal syndrome. After 2 weeks a patient developed thrombosis of recently placed stents which was required vascular reconstruction of HA by using autovenous graft. The condition complicated by development of a cholangiogenous hepatic abscesses and sepsis despite of all used possible methods of liver graft revascularization. However, used methods of vascular correction, which combined of timely carried out intensive care and antibiotic therapy according microbiology laboratory results allows saving graft function. After treatment of septic complications and patient's somatic status stabilization and normalization of laboratory results liver retransplantation was performed.

Keywords: liver retransplantation, hepatic artery (HA) thrombosis, stent placement of HA, bile ducts necrosis, sepsis, hepatic abscesses, splenic artery steal syndrome.

INTRODUCTION

Orthotopic liver transplantation is presently the only definitive treatment option for patients with end-stage chronic liver disease. In experimental centers, the 10-year patient survival following liver transplantation is about 70% [1, 2]. However, due to the growing number of surgical interventions, despite improvements in surgical techniques, anaesthetic support and immunosuppression methods, complications such as hepatic artery thrombosis (HAT) and primary graft dysfunction occurring in the early postoperative period lead to persistent impairment of liver function. In such cases, liver retransplantation is the only alternative to death. According to data from modern world literature sources, about 10–20% of patients need retransplantation [3–5]. These surgical procedures are indisputably associated with significant technical difficulties, they are considerably expensive and carry worse results than in primary transplantation [6, 7]. Besides, the ethical issue of priority among retransplant and primary transplant candidates with regards to donor organs remains debatable. In the current situation where there is shortage of donor organs, all treatment options should be used in early complications at the appropriate time to maintain an adequately functioning graft. So, in HAT, the success of early surgical, including endovascular revascularization, reaches about 50–70% [8, 9], which may be an acceptable option for rescuing a graft or serve as a link for retransplantation when a donor appears [8].

DESCRIPTION OF OBSERVATION

Patient K., 50 years old, on April 1, 2018, underwent orthotopic liver transplantation (OLT) for chronic viral mixed hepatitis with outcome in Child-Pugh class C cirrhosis. MELD score of 17. The inferior vena cava (IVC) was reconstructed through a piggyback technique. Anastomosis of the portal veins (PV) of the donor and recipient was performed in an end-to-end fashion. Arterial anastomosis between the donor's proper hepatic artery (PHA) and the recipient's PHA (the site of the right hepatic artery and the left hepatic artery) was performed in an end-to-end way. After completing arterial reconstruction and starting blood flow through the hepatic artery, a dissection site with subintimal blood flow was detected (on the donor site of PHA, almost throughout its entire length) with a 40 ml/min volumetric blood flow (VBF) rate. An audit was performed with an umbilical catheter followed by heparinization of the HA channel. The gastroduodenal artery (GDA) was ligated, after which VBF increased to 130 ml/min. Portal vein VBF was 2500 ml/min. After end-to-end biliary reconstruction on the "lost" drainage, VBF was re-evaluated and the hepatic artery VBF was found to has reduced to 35 ml/min. Arterial

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reconstruction using autologous veins or other grafts was found to be inadvisable due to the small diameter of the left hepatic artery and right hepatic artery (not more than 3 mm for each). Under X-ray operating conditions, direct celiacography (Fig. 1, a) and direct perfusion imaging of the liver (Fig. 1, b) were performed. Hemodynamically significant narrowing at the anastomosis site with pre- and post-stenotic dilatations was visualized, with subintimal dissection and turbulent blood flow. Stenting was performed on a 300 cm Boston Scientific microconductor by a stent-in-stent method. Two 4×23 mm Aneugraft stent grafts were installed. On the control angiogram, the stents were straightened, there was adequate arterial blood flow to the liver, the blood vessels was filled, there was no extravasation (Fig. 2). The decision was taken to conduct an anticoagulant therapy with heparin

a

b

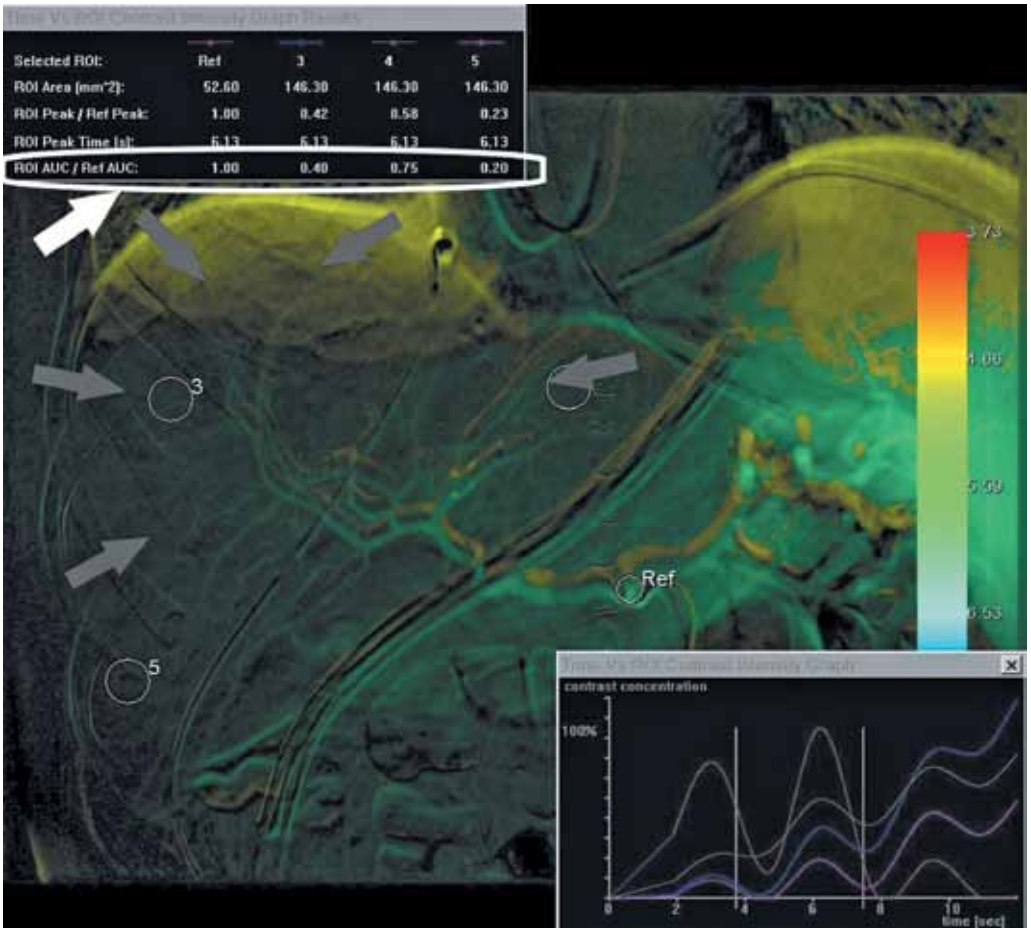

Fig. 1: a – celiacography: hemodynamically significant stenosis is visualized at the level of the common hepatic artery – a black arrow; the depletion of arterial architectonics at the segmental level – white arrows; b – perfusion study of the liver: depletion of arterial filling at the level of segments and subsegments – gray arrows; significant reduction of perfusion (ROI AUC / Ref AUC) in the projection SII, SVI, SVII – white arrow

500 units/h intravenously. On the first day after OLT and HA stenting, ultrasound examination with Doppler ultrasonography (ultrasound + DU) of the liver vessels did not detect the hepatic artery. A section of ischemia 5 cm in size was identified in the S7 liver. Repeated celiacography was performed, HA subocclusion was detected with up to 20% lumen narrowing. Patency was preserved, splenic artery steal syndrome – the splenic artery (SA) diameter was 2.5 times greater than that of the HA (Fig. 3). HA balloon angioplasty was performed with a 4×23 mm balloon, mechanical embolization of the SA was done using five Cook MReye metal coils 10 mm in diameter and one Azur Terumo 6×18 mm coils. Angiograms showed restoration of adequate HA patency and absence of blood flow through SA (Fig. 4). On the second day, control angiography showed that signs of splenic artery steal syndrome with positive dynamics remained. Repeated mechanical embolization of SA was performed with five Cook MReye metal coils 10 mm in diameter and one Azur Terumo 6×18 mm coil. After 9 days (on April 13, 2019), according to laboratory data, there was significant increase in D-dimer result 3000 ng/ml, ALT was 150 U/L, AST 270 U/L, total bilirubin 42 μmol/L, leukocytosis 11,000. Based on multispiral computed tomography (MSCT) results, signs of HA stenosis, ischemic hepatitis of S7, S8 liver were visualized. Under X-ray surgery conditions, arterihepatography was performed, HA lumen was found to have significantly narrowed and blood flow was weakened. Stenting was done with a 4×23 Aneugraft stent graft (Fig. 5) with restoration of the arterial architec-

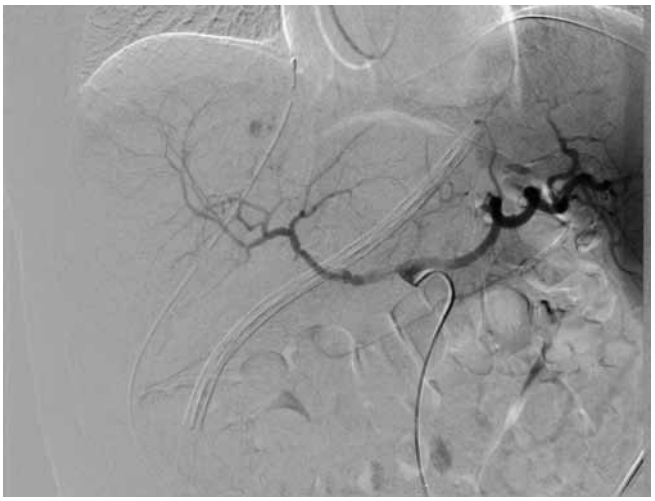

Fig. 2. Celiacography after stent placement in the subintimal dissection area

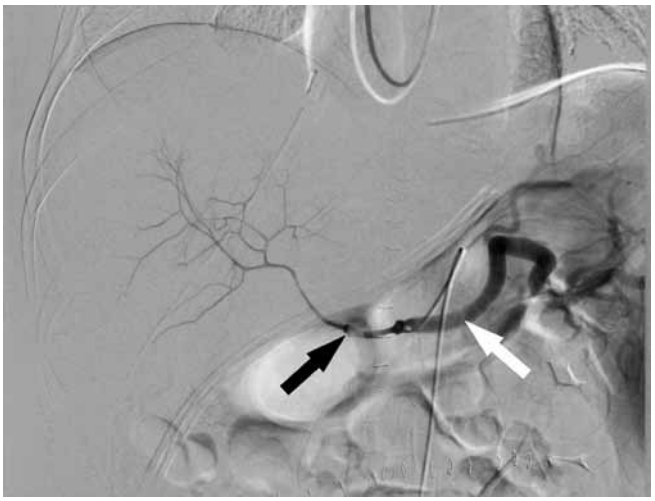

Fig. 3. Celiacography. The subocclusion of the hepatic artery in front of the previously installed stents – black arrow. Strengthening of a blood-groove and expansion of a splenic artery (splenic artery steal syndrome) – a white arrow

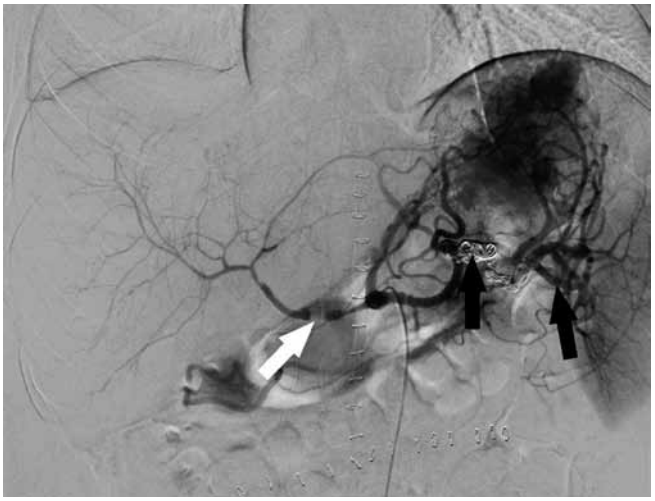

Fig. 4. Celiography after embolization of the splenic artery. Metal emboli in the trunk of the splenic artery, the trunk of the splenic artery is occluded, the arterial blood supply of the organ along the collaterals – black arrows. The area of the hepatic artery subocclusion – white arrow

Fig. 5. Celiacography after installing the third stent "Stent in Stent". The contours and patency of the hepatic artery restored – white arrow. Splenic artery steal syndrome is eliminated – black arrow. Arterial architectonics of the liver is determined at the subsegmentary level

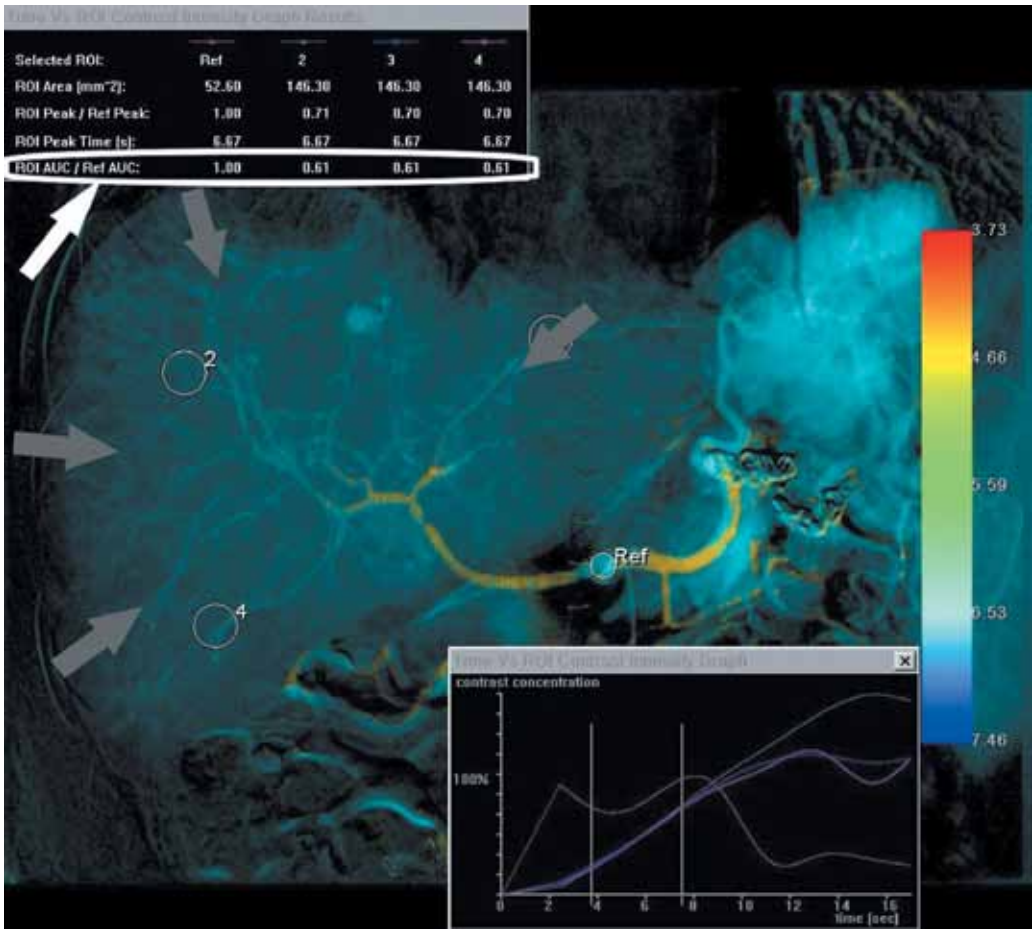

Fig. 6. Perfusion study of the liver after endovascular correction. Arterial filling at the level of segments and subsegments – gray arrows. Restoration and alignment of perfusion (ROI AUC/Ref AUC) in projection SII, SVI, SVII – white arrow

tonics of the organ and normalization of perfusion in all the liver segments (Fig. 6). According to laboratory data, April 4, 2019, D-dimer result was 3500 ng/ml, ALT was 247 U/L, AST 414 U/L, total bilirubin 87 μmol/L, leukocytosis 13 × 10^9 U/L, and procalcitonin 42 ng/ml. According to results obtained from blood culture on April 16, 2018, there was increase in Enterococcus faecium and Escherichia coli. The patient was diagnosed with sepsis. Antibiotic therapy was corrected based on the sensitivity of microorganisms. Immunosuppression was reduced. Arterial hepatography revealed thrombosis of previously installed stents. Attempts at catheterization and thromboaspiration were unsuccessful. Autogenous prosthesis installation of PHA were performed (Fig. 7). During control angiography test conducted in April 20, 2018, arterial blood supply to the liver was detected, but it was sharply weakened along the periphery. According to laboratory indicators, ALT was 508 U/L, AST 126 U/L, total bilirubin 31 μmol/L, white blood cell count 10 × 10^9 U/l. Based on CT data (April 23, 2018), the shunt was passable, but there was sharp narrowing of the hepatic arteries at a 3 mm bifurcation level, lobar arteries were less than 1 mm, there was fluid in the liver parenchyma, necrosis zone in the right lobe was 9 × 3 × 7 cm in size. On April 30, 2018, bile appeared from postoperative wound and through the drainage from the abdominal cavity. On magnetic resonance cholangiopancreatography (MRCP) performed, peripheral bile ducts were not visualized, fluid component is detected over bifurcation in the form of bile duct, lobar ducts were not visualized (Fig. 8).

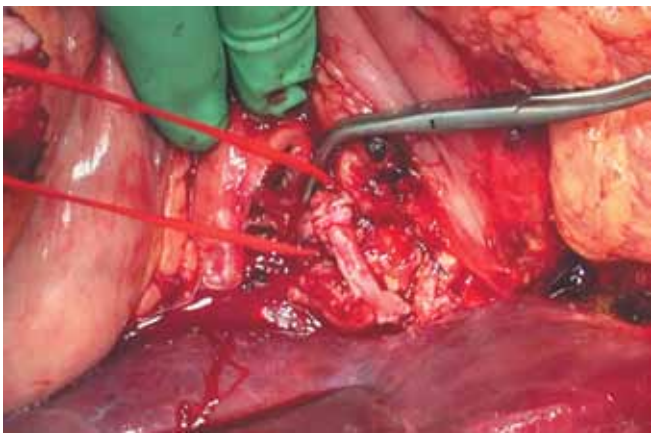

Fig. 7. Autovenous prosthetics of own hepatic artery

It was decided to perform relaparotomy. Intraoperatively: common bile duct (CBD) with signs of necrosis, but without damage to its integrity, anastomosis was

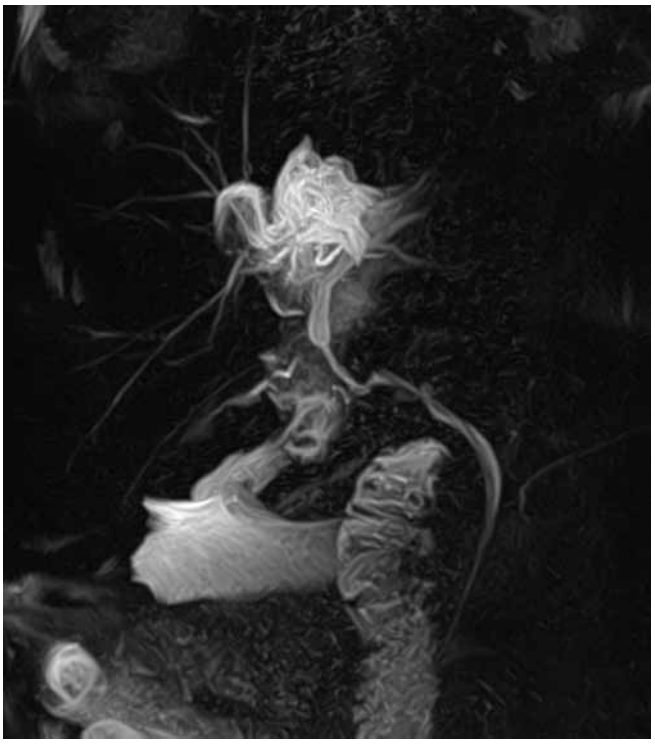

Fig. 8 The leakage of the contrast agent in the portal fissure of the liver in MRCP

Fig. 9. Formed choledochostomy. Drainage installed in the resected abscess area S4,5

firmly done, and HA pulsation is preserved. Bile flow from the abscess of S4.5 liver was visualized. Segments 2-3, 7-8 are with signs of necrosis, without suppuration. Abscess was opened and drained in S4.5, necrotic CBD was excised, while choledochostomy and enterostomy were performed for bile reinfusion (Fig. 9).

Liver retransplantation was performed on May 10, 2018 amid improvement in the patient's somatic state, clinical and laboratory parameters Hb 110 g/L, Tr 505 × 10^9 U/L, creatinine 54 μmol/L, total bilirubin 21 μmol/L, ALT 210 U/L, AST 80 U/L, achievements in sterility of blood and bile cultures. IVC was reconstructed through a piggyback technique. PV anastomosis was performed in an end-to-end manner. Arterial anastomosis was done using a vascular graft (a donor fragment of the internal iliac artery) directly with the aorta. Biliary reconstruction – hepatitis enteroanastamosis using the Roux-en-Y jejunal limb on Voelcker's drainage. The removed liver was sent for histological examination (Fig. 10).

The postoperative period was complicated by postoperative wound suppuration, focal necrosis of S8 liver and an episode of cholangitis on the seventh day with the growth of E. Coli based on bile inoculation results. cAntibiotic therapy was carried out after determining the sensitivity of microorganisms to antibiotic and immunosuppression was reduced. This led to the disappearance of complications. The patient was discharged for outpatient treatment on the 35th day. With a 10-month follow-up period, no significant deviations in laboratory parameters and in MSCT data were detected.

Fig. 10. Remote transplant with areas of ischemia, aseptic necrosis, biligenic abscess in S4,5

DISCUSSION

Liver transplantation is among the most complex surgical interventions in terms of both technical implementation and postoperative management of patients. Success of this operation depends on coordinated interaction among a large team of surgical and therapeutic specialists, as well as resuscitation anesthetists. The scope and nature of treatment requires the team to make right and timely decisions within the entire arsenal of opportunities that the clinic has.

According to modern world literature sources, HA thrombosis is the second main cause of liver graft loss after primary nonfunction [8]. Early diagnosis is a key point in this vascular complication. It helps to avoid

rapid graft loss. There are generally three methods for treating hepatic artery thrombosis: revascularization, retransplantation, and observation. However, the choice of any of these treatment options depends on the time of diagnosis. Retransplantation is the method of choice for most patients, showing the best results. Nevertheless, this treatment option is extremely limited due to shortage of donor organs. In this regard, emergency revascularization should be the first step in treatment, especially in cases of early diagnosis, when it is possible to assume non-critical ischemic injury to the graft [9–11]. Any perfusion disturbance is extremely sensitive for a transplanted liver since it is devoid of vascular collaterals. The etiology and risk factors for development of liver abscess are thought to be associated with the anatomy and blood supply of the biliary tree – bile ducts are nourished by their own arterial supply, the peribiliary plexus. This capillary network originates from the hepatic artery and is strictly arranged around the intrahepatic bile ducts [12]. Thus, blood supply to the biliary system mainly depends on blood flow in the hepatic artery. Therefore, with hepatic artery thrombosis, the intrahepatic ducts suffer from insufficient perfusion, which leads to formation of bilomas and biliogenic abscesses. According to several studies, infections are one of the main factors affecting the outcome of liver transplantation [13]. In our case, dissection of the intima of the hepatic artery was detected intraoperatively, stenting was performed in the first two hours. However, despite early diagnosis and revascularization, as well as in connection with the splenic artery steal syndrome that developed on the first day, significant blood flow disturbances persisted, and a fairly large area of ischemia was already visualized by ultrasound in S7.

Considering previous successful interventions in post-liver transplant vascular complications [14], in this case we also hoped for success. However, ultrasound and MSCT scans showed there was negative dynamics in the form of appearance of new ischemic foci, zones of necrosis. With a moderate increase in transaminases and bilirubin on the 14th day following transplantation, control angiography revealed thrombosis of previously installed stents. Lack of donor organs in such cases necessitates continuation of the struggle for a transplant, which was undertaken by us through autovenous prosthesis installation. Amidst immunosuppression, impaired blood supply to the liver, recurrent episodes of cholangitis, and abscess formation, the risk of developing septic complications is extremely high. Our patient also developed sepsis with the growth of Enterococcus faecium, Escherichia coli in blood cultures. Abscessing of S4.5 led to the development of delimited bile peritonitis, which necessitated relaparotomy. Choledochostomy and enterostomy were required for bile reinfusion. Many studies have shown that the best outcomes of liver retransplantation are achieved by creating optimal conditions for its implementation, stabilizing the patient's condition, normalizing laboratory parameters and kidney function, an achieving sterility of crops at the time of retransplantation [13, 15]. For almost a month before retransplantation, comprehensive intensive infusion, replacement, antibacterial therapy based on inoculation results were carried out in our patient in an intensive care unit. It is reported that renal failure is accompanied by a number of impaired cell-mediated and antibody-mediated immune responses, which predispose to postoperative sepsis and exacerbate its course [16]. Similarly, hyperbilirubinemia predisposes to endotoxemia, impaired cell-mediated immunity [17] and Kupffer cell dysfunction [18]. After there has been a decision for retransplantation, immunosuppression should be reduced so that any nephrotoxic effects of cyclosporin or tacrolimus are minimized and the effects of the patient's immune system on infection are enhanced, potentially improving the outcome [13]. Based on global trend and statistics, we reduced immunosuppression and conducted two hemodiafiltration sessions immediately before retransplantation, thereby normalizing laboratory parameters.

CONCLUSION

So, based on our own experience and that from our domestic and foreign colleagues, we believe that attempts at endovascular revascularization in cases of hepatic artery subocclusion and thrombosis in early stages are well justified. In situations requiring retransplantation, we consider it expedient to perform retransplantation only after the patient's somatic status has been stabilized, and manifestations of systemic inflammatory reaction reduced.

The authors declare no conflict of interest.

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