CASE REPORT

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Treatment of splenic artery aneurysms of patients with cirrhosis in the Waiting list

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Abstract

Objective. *The aim of our work was to evaluate the immediate and remote results of ligation of splenic artery aneurysm in orthotopic liver transplantation in patients with decompensated liver cirrhosis.*

Material and methods. *From June 2018 to May 2024, 232 liver transplants from a posthumous donor were performed at the Surgical Clinic of the Moscow Multidisciplinary Scientific and Clinical Center n.a. S.P. Botkin. In 4 patients (1.7%), the presence of aneurysmal dilatation of the splenic artery was revealed at the preoperative stage. During orthotopic liver transplantation, patients underwent ligation of the splenic artery proximal and distal to the aneurysms.*

Results. *Mean time for the isolation and ligation of the splenic artery aneurysm was 18.4±3.3 minutes. In no case was there any damage or*

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bleeding from either the branches or the aneurysm of the splenic artery; and there was no damage to the spleen. No adverse events related to the splenic artery aneurysm ligation were recorded in either early or late postoperative periods. In all cases, the control examination did not reveal any ischemic changes in the splenic parenchyma.

Conclusion. *Ligation of the splenic artery aneurysm during orthotopic liver transplantation is a safe, effective and necessary surgical intervention that can improve long-term results by reducing the risk of death from aneurysm rupture in the postoperative period.*

Keywords: splenic artery aneurysm, liver cirrhosis, orthotopic liver transplantation, ligation of the splenic artery aneurysm

Conflict of interest The authors declare no conflict of interest

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SAA, splenic artery aneurysm

US, ultrasound examination

Introduction

Splenic artery aneurysms (SAAs) are found in 0.1% of cases in large autopsy series [1-2]. Meanwhile, the SAA incidence in patients with portal hypertension makes 8.8–50% [3-4]. The SAA rupture in liver transplant recipients is associated with extremely high mortality, which can reach 80% [5].

In a recent systematic review of SAA treatment in cirrhotic patients on the liver transplant waiting list, D. Phan et al. [5] published data from

11 articles containing information on 159 liver transplant recipients with SAA, with more than 80% of aneurysms located distally or proximally in the splenic hilum; and more than 50% of patients had multiple aneurysms. Of the 86 patients with SAA who did not receive surgical treatment for the aneurysm, 4 (4.6%) experienced a rupture in the post-transplant period, which resulted in death in 50% of cases.

Currently, various surgical (open and laparoscopic) techniques and X-ray surgical methods are used to treat SAA: clipping of the splenic artery, the aneurysm resection with forming a vascular anastomosis, the aneurysm resection with splenectomy, including with the distal resection of the pancreas, X-ray endovascular embolization or stenting of the splenic artery [6-8].

The recent cohort study results have demonstrated a significant increase in the risk of hematological malignancies, gastrointestinal cancer, and head and neck cancer in patients who have undergone splenectomy [9]. This serves as a basis for organ-saving operations when planning the surgical treatment for SAA.

Due to a high incidence of SAA in patients with the liver cirrhosis complicated by portal hypertension, as well as the extremely high incidence of fatal complications arising from aneurysm rupture in the post-transplant period, and the lack of homeland publications on this problem, the aim of our study was to summarize the experience of the *Multidisciplinary Scientific and Clinical Center (MMNCC) n.a. S.P. Botkin* in the treatment for SAA in liver transplant recipients.

Material and methods

From June 2018 to May 2024, 232 liver transplants from deceased donors were performed in the surgical clinic of MMNCC n.a. S.P. Botkin. All potential recipients underwent multislice spiral computed tomography

(MSCT) of the abdominal organs with intravenous contrast in addition to routine examination before being placed on the waiting list. In 4 patients (1.7%), MSCT revealed the presence of aneurysmal dilation of the splenic artery (Fig. 1).

Fig. 1. Abdominal multislice spiral computed tomography with intravenous contrast. Splenic artery aneurysms 29x26 mm and 32x29 mm in a patient with liver cirrhosis and portal hypertension (arrows indicate proximal and distal aneurysms of the splenic artery)

In all cases, a multidisciplinary council made a decision to perform simultaneous surgical intervention: orthotopic liver transplantation and ligation of the splenic artery proximally and distally to the aneurysms.

Simultaneous surgical intervention technique

After performing hepatectomy, forming cava-caval and porto-portal anastomoses, the venous reperfusion of the liver graft and hemostasis, the omental sac was opened by dissecting the ligamentum

gastrocolicum. The splenic artery with a section of aneurysmal expansion was isolated along the anterior-superior surface of the pancreas (Fig. 2). After the aneurysmal neck ligation, the absence of blood flow in it was confirmed by intraoperative ultrasound examination (US).

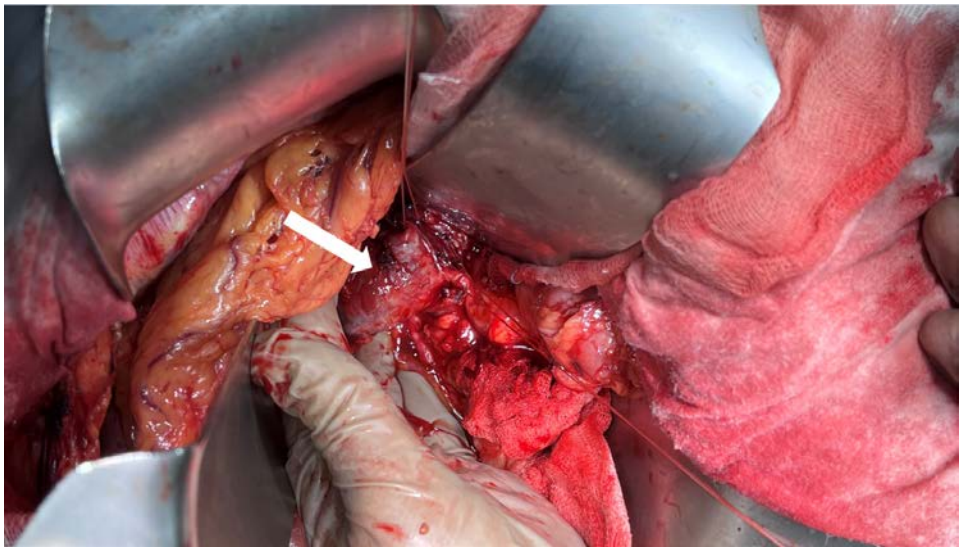

Fig. 2. Intraoperative photo. Isolation and ligation of the splenic artery aneurysm (marked with an arrow)

In all patients, an attempt was made to preserve the maximum length of the splenic artery stump, for the cases where it must be used to form an anastomosis with the graft hepatic artery.

In the early postoperative period, the blood flow in the spleen, the presence of effusion in the abdominal cavity or splenic abscesses were also assessed at ultrasound examination of the liver graft.

Results

The mean time of the SAA isolation and ligation stage was 18.4±3.3 minutes. There was no damage or bleeding from the SAA and no spleen injury in any case. No adverse effects related to the SAA ligation were recorded neither in early nor late postoperative periods. In

all cases, no ischemic changes in the spleen parenchyma were detected during the control examination (Fig. 3).

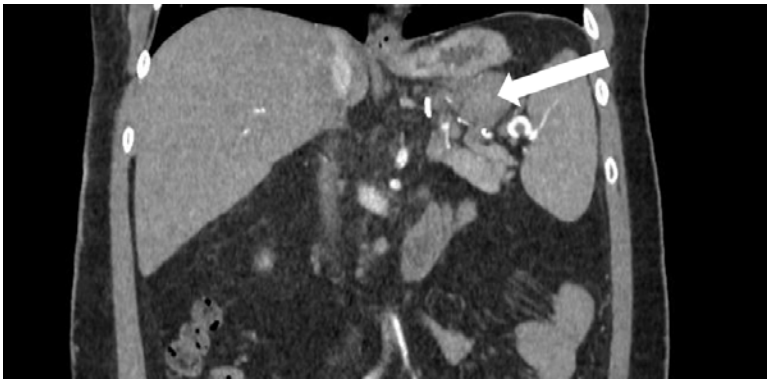

Fig. 3. Abdominal multislice spiral computed tomography with intravenous contrast. Splenic artery aneurysm thrombosis (marked with an arrow)

Discussion

In their study, D. Phan et al. [4] showed that 54% of patients (86/159) underwent no surgical correction of the SAA in the perioperative period, which resulted in its rupture in 4 cases (4.6%) and in a fatal outcome in 2.3% of cases. Based on the published data, the authors made the conclusion on the need for surgical prevention of splenic artery aneurysmal rupture.

Currently, there are several options for SAA endovascular treatment, such as the embolization and stenting of the splenic artery. Despite its minimally invasive nature, this method has a number of disadvantages, including a significant cost, the impossibility of fixing the coil in an aneurysm larger than 5 cm due to the risk of the coil distal migration, as well as the risk of the stent migration and aneurysm rupture [10].

In our opinion, performing surgical interventions on SAA in patients with liver cirrhosis at the pre-transplant stage has a number of disadvantages, such as difficulties in isolating SAA in terms of the portal

hypertension and dilated veins of the greater and lesser omentum, additional technical difficulties in performing laparotomy during liver transplantation after previous surgical treatment for SAA. Performing these interventions after liver transplantation is also inappropriate. Thus, in our opinion, it is the performance of simultaneous operations that is the most preferable method for treating liver cirrhosis and SAA.

We believe that it is preferable to perform surgical correction of SAA after venous reperfusion of the liver graft. First, this stage of the operation does not affect cold and secondary warm ischemia times for the liver graft; second, by this time, the pressure in the portal vein system have decreased, which facilitates the isolation of the splenic artery aneurysm; third, after the venous reperfusion and recipient's condition stabilization, the most dangerous for the patient moment of the operation has passed and, depending on patient's condition, it is possible to plan the further course of the surgical intervention.

In our opinion, splenectomy should not be recommended for these patients because it is an additional risk factor for the development of infectious complications in the early postoperative period and a risk factor for the development of oncological diseases in the long term period. Thus, we believe that SAA ligation during orthotopic liver transplantation is the least complex and most effective method of surgical prevention of SAA rupture.

Conclusion

Detecting the presence of splenic artery aneurysms is an important aspect in a patient examination before the placement on the waiting list for cadaveric donor liver transplantation. The splenic artery aneurysm ligation during orthotopic liver transplantation is a safe, effective, and necessary surgical intervention that improves long-term results by

reducing the risk of death from aneurysm rupture in the postoperative period.

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