LETTER TO THE EDITOR

Hepatic artery aneurysm arising from an interposition vein graft four years after auxiliary partial orthotopic liver transplantation

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The patient was a 19-year-old female who had undergone auxiliary partial orthotopic liver transplantation (APOLT) 4 years earlier. The indication for transplantation was end-stage liver disease because of repeated cholangitis after portoenterostomy (Kasai procedure) for biliary atresia. The donor was the patient's mother, who donated her left hepatic lobe. Because this was a small for size graft, the APOLT procedure was selected. The graft was placed in the space made by resecting the left lateral lobe of the native liver. Before surgery, celiac angiography of the donor as well as the recipient was performed. We had planned to anastomose the left hepatic artery of the donor to the left hepatic artery of the recipient. However, it was very difficult to dissect around the hepatic hilum because of dense adhesions, with the result that the recipient's left hepatic artery was accidentally damaged. There had been no appropriate recipient artery to reconstruct the hepatic artery of the graft because of the constraints of the APOLT procedure (the patient's own liver also still needed hepatic arterial inflow). The recipient's gastroepiploic artery appeared too thin to be used for arterial reconstruction at that time. The right gastric vein, which was placed between the single orifice of the middle and left hepatic arteries of the graft and the right gastric artery of the recipient as an interposition graft, was used to reconstruct the hepatic artery because it seemed to have a relatively thick wall. Arterial reconstruction was done by using interrupted 8–0 Prolene® sutures under the microscope. Splenectomy was performed in order to dissect collateral blood vessels in the left upper abdomen because the patient had been suffering from variceal bleeding and there were risky varices in the stomach.

Three years after transplantation, follow-up computed tomography (CT) examination revealed an aneurysm at the interposition vein graft site, although the patient had no symptoms and the liver was functioning well. Because the diameter of the aneurysm was small at that time (approximately 13 mm), follow-ups were simply continued. One year later thereafter (4 years after APOLT), follow-up CT examination showed that the aneurysm had increased in size slightly to approximately 16-mm diameter (Fig. 1a). A celiac angiogram showed a true aneurysm at the interposition vein graft (Fig. 1b). For fear of rupture of the aneurysm, a revision operation of the

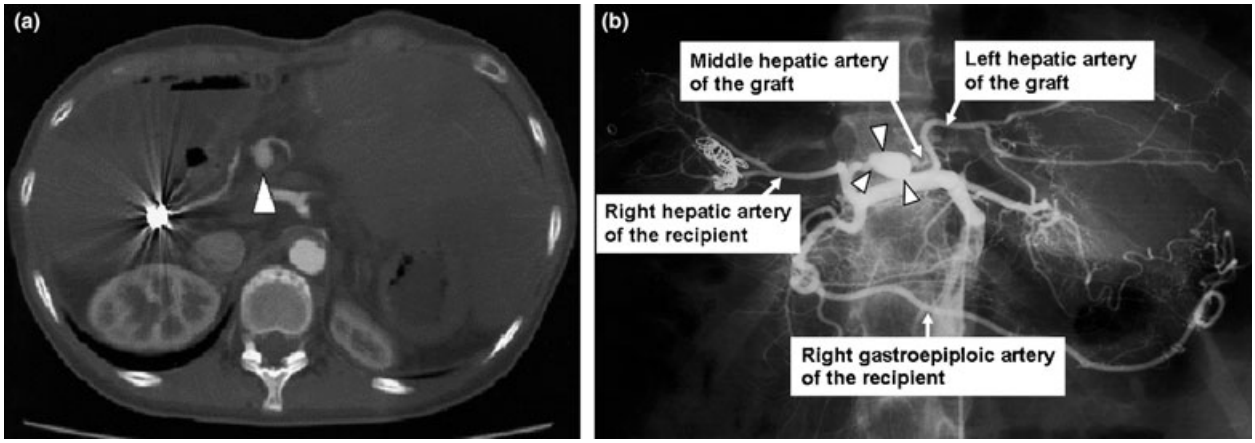

Figure 1 (a) Abdominal computed tomography examination 4 years after auxiliary partial orthotopic liver transplantation (APOLT). Arrow head indicates the aneurysm at the interposition vein graft site. (b) Celiac angiography 4 years after APOLT. Arrow head indicates the aneurysm at the interposition vein graft site. Note the relatively large right gastroepiploic artery.

hepatic artery aneurysm was undertaken. The right gastroepiploic artery had become thickened, probably due to splenectomy, so that it was possible that it could have been used as the arterial inflow into the graft.

On laparotomy, dense adhesions around the liver were noted. By dissecting near the porta hepatis of the graft, the aneurysm was exposed and controlled with tapes. The interposition venous graft had enlarged to form a true aneurysm. The right gastric artery of the recipient and the middle and left hepatic artery of the graft appeared to be normal. After the proximal right gastric artery was ligated, the aneurysm was resected. The right gastroepiploic artery together with the surrounding tissue was freed from the greater curvature of the stomach by dividing the small branches and its peripheral end was brought up to the graft as reported by Ikegami *et al.* [1] (Fig. 2). Arterial reconstruction of the liver graft was done by anastomosing the right gastroepiploic artery of the recipient to the left hepatic artery of the graft. After reperfusion of the arterial inflow, sufficient back flow from the middle hepatic artery was observed, so that the middle hepatic artery was simply ligated. Doppler ultrasound revealed pulsatile arterial inflow into the graft.

Histopathological examination of the resected aneurysmal wall showed neither thrombus formation nor vasculitis. Because the entire structure of the wall was intact, it was considered to be a true aneurysm. The wall demonstrated segmental arterialization and other parts had been largely replaced by fibromascular tissue and fibrotic adventitial tissue (Fig. 3).

Adequate arterial flow in the liver graft was confirmed by a routine daily Doppler ultrasound examination. She

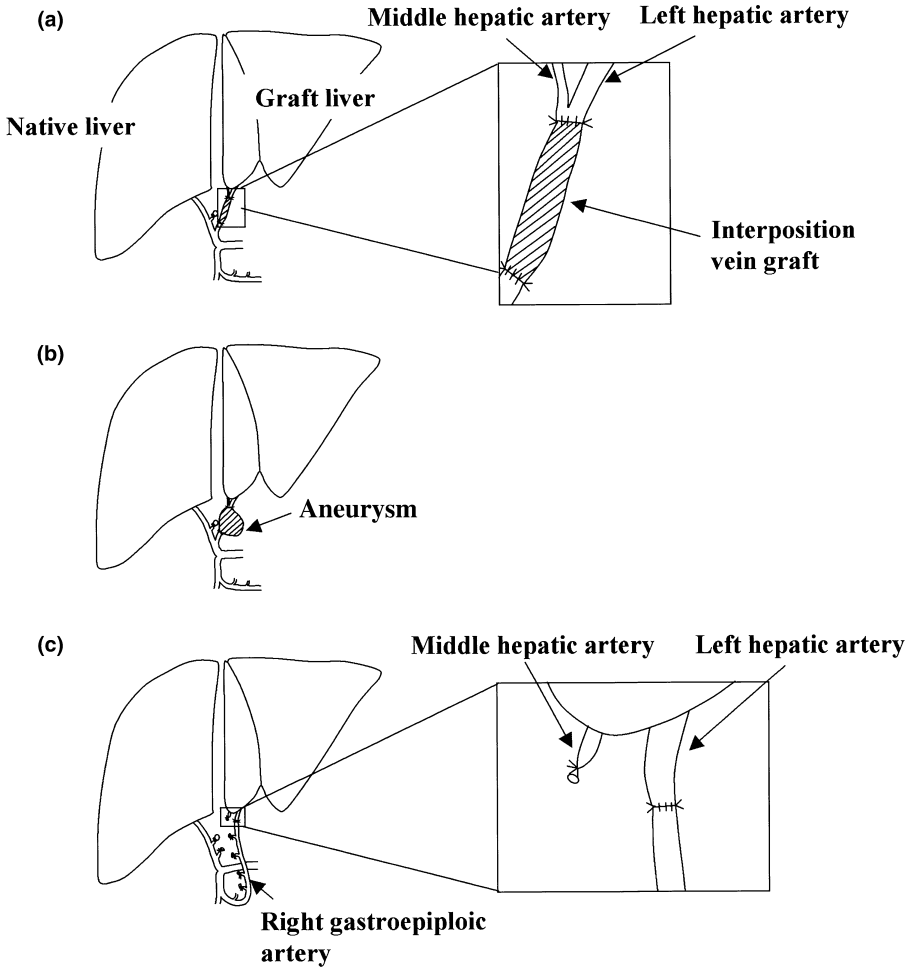

Figure 2 Diagram of hepatic artery re-reconstruction. (a) The right gastric artery of the recipient was anastomosed to the common single orifice of the middle and left hepatic arteries of the graft via the right gastric vein as an interposition vein graft. (b) Aneurysm at the interposition vein graft site 4 years after auxiliary partial orthotopic liver transplantation. The aneurysm is forming at the interposition vein graft site. (c) The right gastroepiploic artery was freed from the greater curvature by dividing the small branches to the gastric wall, and was then anastomosed to the left hepatic artery of the graft. The middle hepatic artery was ligated after confirmation of adequate back flow from the middle hepatic artery.

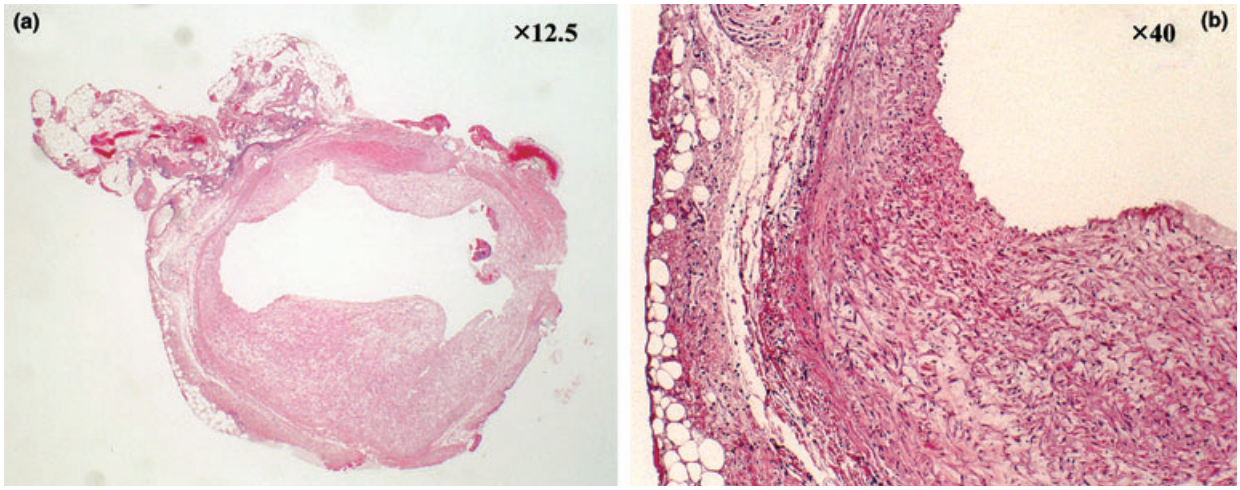

Figure 3 (a) Microscopic appearance of the resected aneurysmal wall (Hematoxylin-eosin, original magnification ×10). Neither thrombus formation nor vasculitis is visible. (b) Higher magnification of the aneurysmal wall (Hematoxylin-eosin, original magnification ×40). The wall is largely replaced by fibromascular tissue and fibrotic adventitial tissue.

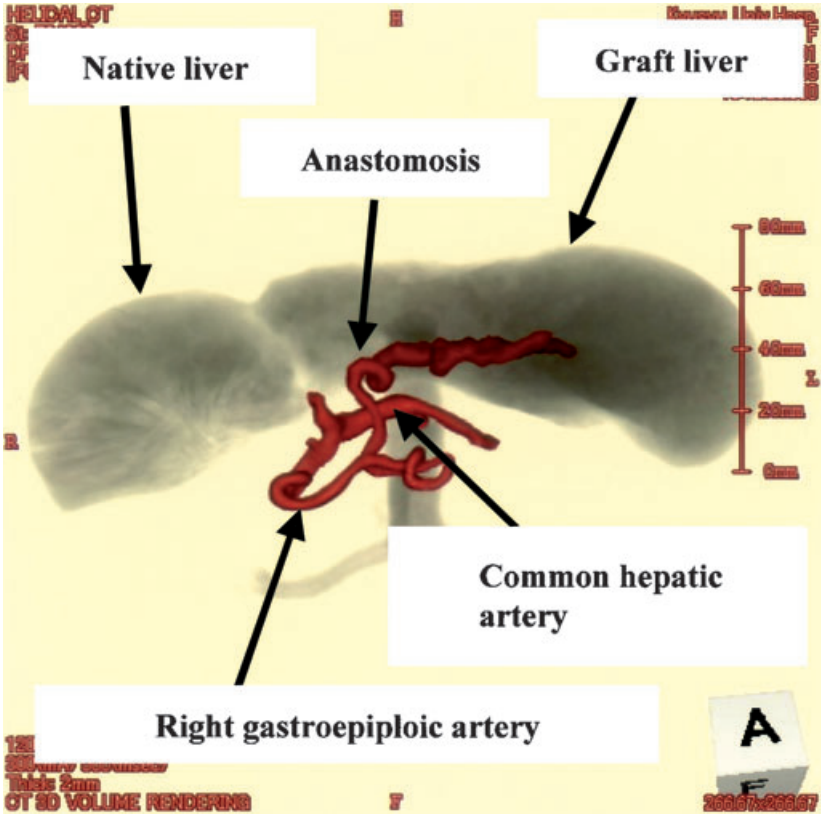

Figure 4 Follow-up computed tomography-angiography examination 1 year after arterial re-reconstruction. The hepatic inflow of the donor graft was intact.

was allowed to leave the hospital 2 weeks after the operation. One year thereafter, follow-up CT examination (Fig. 4) showed adequate hepatic arterial flow in the graft and no sign of aneurysm.

There have been several reports suggesting that the causes of aneurysm or pseudoaneurysm were bacterial or fungal infections [2,3]. The cause of pseudoaneurysm formation was obvious in the case described here – the use

of a vein graft for arterial reconstruction. There were neither microbiological findings nor vasculitis on the wall of the resected aneurysm. In cardiac surgery, it was reported that an autologous arterial conduit would provide better long-term patency for coronary artery bypass grafting [4]. As a result of a similar phenomenon here, the reason that a true aneurysm occurred at the interposition vein graft site was probably the weakness of the wall. Retrospectively, we can conclude that we should not have used an interposition vein graft for arterial reconstruction in this case. Inferior mesenteric arteries [5], radial arteries [6], and sigmoid arteries [7] have all been suggested as candidates for interposition grafts for arterial reconstruction in liver transplantation.

The mortality rate in patients with pseudoaneurysm after liver transplantation is as high as 50% [2]. Presence of localized infection or dense adhesions because of previous operations makes arterial re-reconstructions extremely difficult. However, preservation of hepatic arterial inflow to the graft is imperative to prevent complications originating from biliary ischemia [2]. Interruption of hepatic arterial inflow such as by hepatic artery ligation should be reserved as a last resort.

From our experience with this case and published review articles regarding hepatic artery aneurysm or pseudoaneurysm after liver transplantation, three lessons should be stressed again. Firstly, a vein graft should never be used as an interposition graft for arterial reconstruction in liver transplantation. Secondly, as soon as an hepatic artery aneurysm is found after liver transplantation, surgery should be considered even in asymptomatic patients, for fear of rupture. Finally, if at all possible, arterial re-reconstruction should be undertaken in order to avoid ischemic biliary complications in the future.

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