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International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Two-step hepatic artery reconstruction for a hepatic artery lacking in length for the use of a microclamp in living donor liver transplantation

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ARTICLE INFO

Article history:

Received 20 January 2016

Received in revised form 24 March 2016

Accepted 16 April 2016

Available online 20 April 2016

Keywords:

Microsurgery

Arterial reconstruction

Hepatic artery

Living donor liver transplantation

Arterial graft

ABSTRACT

INTRODUCTION: We describe successful two-step hepatic artery reconstruction in a patient whose graft site hepatic artery was too short for the use of a microclamp in living donor liver transplantation.

PRESENTATION OF CASE: A 57-year-old woman was diagnosed as having hepatitis C and liver cirrhosis. Her 26-year-old son was the living liver donor. The living donor underwent right lobectomy. The dissected graft hepatic artery was too short for the use of a microclamp. The recipient right hepatic artery was cut and used as an arterial graft. The graft right hepatic artery was sutured to the right hepatic artery of the arterial graft and the graft posterior branch of the right hepatic artery was sutured to the middle hepatic artery of the arterial graft. After reconstruction of the portal vein and hepatic vein was completed, anastomosis was performed between the graft right hepatic artery and right hepatic artery. The patency of the vessels was checked using color Doppler ultrasonography for 1 week postoperatively. No postoperative complications involving blood flow of the hepatic artery were observed.

DISCUSSION: In our case, the recipient hepatic artery was cut and used as an arterial graft. Although the number of anastomotic sites of the hepatic artery increased, we could perform hepatic artery reconstruction safely and easily.

CONCLUSION: Two-step hepatic artery reconstruction is a useful method in cases where the recipient hepatic artery does not have enough length.

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1. Introduction

Living donor liver transplantation (LDLT) is an extremely difficult and challenging operation [1,2]. From the point of view of microsurgery, the depth of the anastomotic site, movement of the operative field, and the length of recipient and/or donor hepatic artery are potential problems. It is sometimes necessary to reconstruct a hepatic artery in cases where the artery length is insufficient to allow rotation of a microclamp. To reconstruct a hepatic artery in such a case, we repaired the posterior wall first continuous suturing. However, we experienced a case where the hepatic artery was of insufficient length for the use of a microclamp. In such case, it is very difficult to perform hepatic artery reconstruction as back flow from the graft artery may fill the anastomotic site or the graft liver may obscure the operative field. We therefore invented a two-step hepatic artery reconstruction method. In this report, we describe the details of our new method.

2. Case report

A 57-year-old woman was diagnosed as having non-alcoholic steatohepatitis and severe liver cirrhosis. Four months preoperatively, an LDLT was planned. The living liver donor was her 26-year-old son. Before harvesting the graft liver, a biopsy of donor liver was performed. A graft liver biopsy showed moderate steatosis (30%) was diagnosed. Surgery was stopped and their wounds were closed. Three months after the patient's son recovered from his fatty liver, we performed the LDLT. The living donor underwent a right lobectomy. Because of scar adhesion, the long hepatic artery was not preserved. The graft hepatic artery was 3 mm in length and was too short for the use of a microclamp (Fig. 1). We decided to perform a two-step hepatic artery reconstruction.

In the first step, hepatic arterial reconstruction was performed on the back table before reconstruction of the portal vein and hepatic vein. The recipient right hepatic artery was cut and used as an arterial graft (Fig. 2A). The graft anterior branch of the right hepatic artery was sutured to the right hepatic artery of the arterial graft, and the graft posterior branch of the right hepatic artery was sutured to the middle hepatic artery of the arterial graft (Fig. 2B) (Fig. 3). After reconstruction of the portal vein and hepatic vein was completed, we began the second step. Anastomosis was performed

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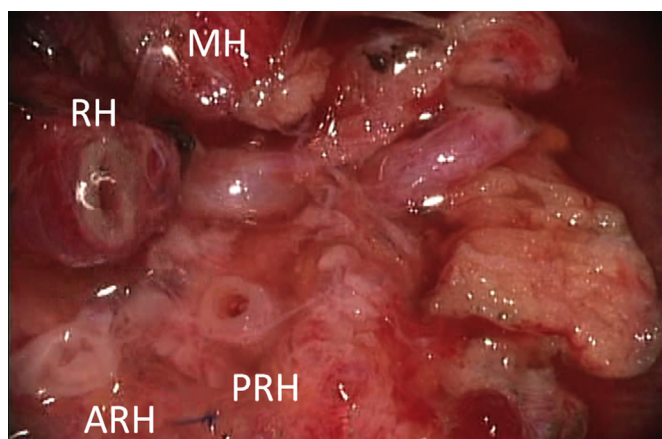


Fig. 1. Both ARH and PRH did not have enough length to rotate the microclamp. The RH and MH of artery graft are also seen.
 ARH: Anterior branch of right hepatic artery.
 PRH: Posterior branch of right hepatic artery.
 RH: Right hepatic artery.
 MH: Middle hepatic artery.

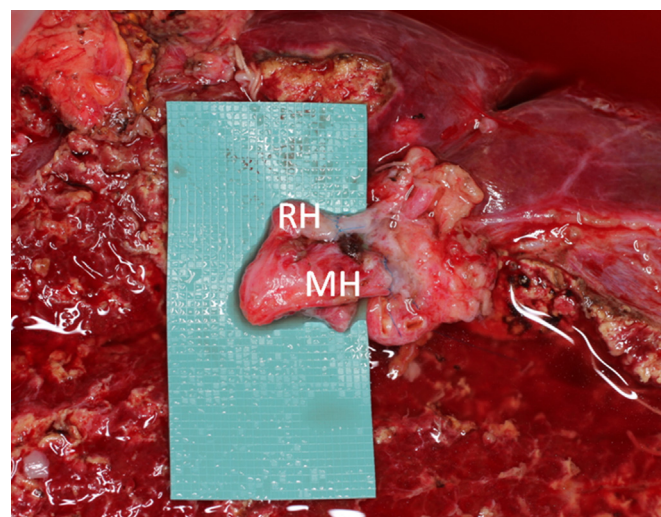


Fig. 3. After the first step of hepatic artery reconstruction.
 RH: Right hepatic artery.
 MH: Middle hepatic artery.

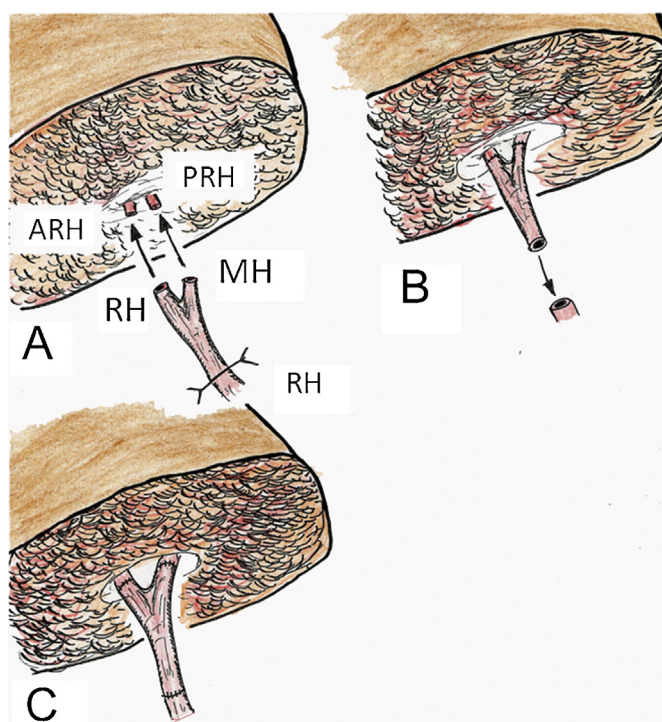


Fig. 2. Schema of our method.
 The recipient right hepatic artery was cut and used as an arterial graft (A).
 The hepatic arteries of graft liver were sutured to the distal site of the arterial graft (B).
 Anastomosis was performed between the graft right hepatic artery and the recipient right hepatic artery. This anastomotic site was at the point where we cut the recipient right hepatic artery. These two anastomosis were performed on the back table.
 ARH: Anterior branch of right hepatic artery.
 PRH: Posterior branch of right hepatic artery.
 RH: Right hepatic artery.
 MH: Middle hepatic artery.
 The hepatic arterial reconstruction was completed (C).

between the graft right hepatic artery and the recipient right hepatic artery. This anastomotic site was at the point where we cut the recipient right hepatic artery (Fig. 2C) (Fig. 4). All vascular anastomoses were performed by end-to-end suturing with 8-0 PRONOVA surgical nylon (Ethicon Inc., Edinburgh, UK) under an operating

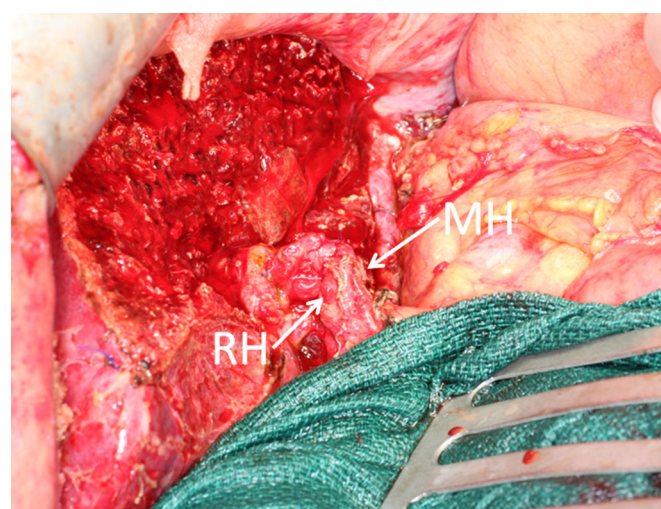


Fig. 4. After all vascular anastomoses were complete.
 RH: Right hepatic artery.
 MH: Middle hepatic artery.

microscope. Immediately after the hepatic artery reconstruction, the patency was checked using color Doppler ultrasonography. This examination was performed twice a day for 1 week, and once a day for the following 1 month. No complications involving blood flow of the hepatic artery were observed. At 4 months after surgery, blood flow to the graft liver was confirmed by a contrast CT scan (Fig. 5).

3. Discussion

In this report, we describe the successful reconstruction of a hepatic artery of insufficient length for the use of microclamp. Reconstruction of the hepatic artery in LDLT has been challenging for microsurgeons [1,2] as the operative field is deep in the abdominal cavity and is influenced by respiratory movement. The working space for the surgeon's left hand is limited by the costal arch and/or graft liver. Furthermore, the length of hepatic artery is also a problem because some graft and/or recipient hepatic arteries do not have enough length to rotate a microclamp. To solve this problem, posterior wall first suturing was introduced by Yamamoto et al.



Fig. 5. Four months after surgery, blood flow to the graft liver was confirmed by a contrast CT scan (arrow).

[3]. Okazaki et al. reported on posterior wall first suturing using 9-0 double needles nylon [4]. We also reported on posterior wall first continuous suturing [5]. In cases where the recipient hepatic artery is of insufficient length, an arterial graft is used or another source vessel is used. Mizuno et al. [6] and Kamei et al. [7] reported on arterial grafting using a radial artery and Nakatsuka et al. [8] also reported on arterial grafts using an inferior epigastric artery. In cases where the recipient arteries were too short, the splenic artery, inferior mesenteric artery, and right gastroepiploic artery are known as source vessels for hepatic artery reconstruction for LDLT or hepatic tumor ablation [3,9]. However, we felt the need to establish a new method for the case where the graft hepatic artery is of insufficient length to use a microclamp. It is very difficult to perform hepatic artery reconstruction as back flow from the graft artery may fill the anastomotic site or the graft liver may obscure the operative field. However, there have been no reports on how to overcome the problem of insufficient length of the graft hepatic artery. Immediately after dissection of the graft hepatic artery, the transplant surgeon consulted us. Although the graft hepatic artery was very short, we had to reconstruct two arteries because the graft hepatic artery had an anterior and posterior branch. We assumed that we could not use a microclamp, and therefore performed arterial reconstruction on the back table. Arterial reconstruction could easily be performed because nothing obscured the operative field. Moreover, there was no back flow from the hepatic artery, which made it easier to perform anastomosis. Compared to direct anastomosis, our method required additional vascular anastomosis. Although many authors have reported on the safety of arterial grafting in LDLT, we believe that our method was very useful for arterial reconstruction in LDLT. Our method requires for hepatic arterial reconstruction need to be performed prior to portal vein and hepatic vein reconstruction. To perform our method, good communication between transplant surgeons and microsurgeons is important.

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4. Conclusion

We reconstructed the hepatic artery in LDLT using two-step hepatic artery reconstruction. This is a useful method for cases where the graft hepatic artery is insufficient in length for a microclamp to be used.

Conflict of interest

No conflicts of interest.

Funding

None.

Ethical approval

Because of the case report, ethical approval was not required in our institute.

Consent

Studies on patients require full informed written consent. The copy of the written informed consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Masayuki Okochi, Kazuki Ueda: Written.
Akira Kenjo, Mitsukazu Gotoh: Collecting date.

Guarantor

Masayuki Okochi.

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