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Full Length Research Paper

Application of obstruction of Glission pedicle combined with partial occlusion obstruction of inferior vena cava in regional liver resection

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This study aims to investigate the clinical effect of Glission pedicle obstruction combined with partial obstruction of inferior vena cava in regional liver resection. A total of eight liver cancer patients were retrospectively analyzed. They underwent regional liver resection using a combined method of Glission pedicle obstruction and partial obstruction of inferior vena cava. Among these cases, three received right liver resection, two received left liver resection and others received right posterior lobe resection. Operation time and blood loss were measured. After operation, aspartate transaminase (AST), alkaline phosphate (ALP), albumin, ascites and enterocinesia recovery time were calculated, respectively. Preoperative evaluation of these cases showed that they shared the features of indocyanine green (ICG)-15 min retention rate of < 10% and the remnant liver volume > 40%. The operation time ranged from 60 to 90 min, and the average blood loss was 100 to 200 ml. There were no significant differences in AST and ALP before and after operation. The postoperative albumin decreased by about 10 g. Ascites occurred in all cases after operation, but after infusion of albumin, diuretics disappeared, and enterocinesia was restored two days later. Glission pedicle obstruction combined with partial obstruction of the inferior vena cava can notably shorten the operation time of regional liver resection and reduce the blood loss.

Key words: Glission pedicle, partial obstruction of the inferior vena cava, regional liver resection.

INTRODUCTION

Hepatic cellular cancer (HCC) is one of the most common malignant cancers in the world, and HCC patients increase by five hundred thousand to one million every year (El-Serag and Rudolph, 2007; Leong and Leong, 2008). Though, there are different treatment methods for HCC, surgery still remains the most effective till now (Lau et al., 2004; Lau, 2002). In HCC surgery, ischemical reperfusion injury caused by hepatic portal occlusion and the blood loss are two key factors for postoperative recovery and prognosis (Jarnagin et al., 2002; Wei et al., 2003; Poon et al., 2004). During the surgery, in order to reduce the intraoperative blood loss, various methods for hepatic portal occlusion have been adopted, such as Pringle hepatic portal occlusion, whole-liver blood flow obstruction, regional hepatic portal occlusion, etc. However, all these methods have serious disadvantages. They can increase the mortality as well as the risk of exposure to postoperative complications (especially the complication of hepatic cirrhosis) due to ischemical reperfusion injury (Gozzetti et al., 1995; Bruix et al., 1996; Imamura et al., 2003). Meanwhile, these methods can not give rise to an ideal intraoperative blood loss-reducing effect (the blood loss still ranges from 300 to 1000 ml). Liver can be divided into three lobes (Takasaki, 2007). Liver pedicles of different lobes can be isolated by lowering the hepatic hilar plate outside the liver, based on which the blood flow in the needed lobe for resection can be totally blocked off. Pedicle obstruction combined with

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Table 1. Data of the eight HCC patients.

Clinical data	Age (years)	Tumor diameter (cm)	Operative time (min)	Blood loss (ml)	Stay length (d)
RLR	35 ± 12	10.5 ± 6.8.	75 ± 15	120 ± 80	9 ± 3
LLR	39 ± 11	6.5 ± 5.2	35 ± 12	55 ± 25	8 ± 4
RPLR	42 ± 7	5.7 ± 6.8	45 ± 24	80 ± 35	9 ± 3

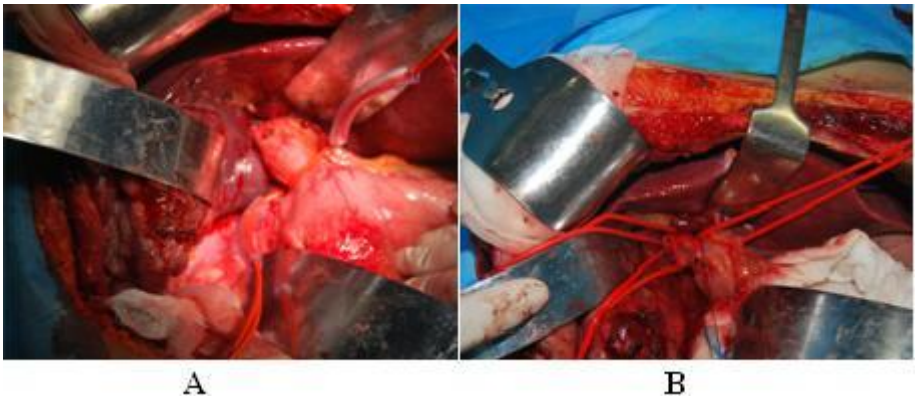

Figure 1. Glission pedicle obstruction combined with partial obstruction of inferior vena cava during operation. A. Partial obstruction of inferior partial obstruction of inferior vena cava; B. Glission pedicle obstruction combined with vena cava.

partial occlusion of inferior vena cava encompasses the merits of different methods for hepatic portal occlusion. It is a safe, simple and accurate method, and the consequent ischemical reperfusion injury is small.

MATERIALS AND METHODS

Clinical data

A total of eight patients with HCC (Table 1) received regional liver resection using the combined method of Glission pedicle obstruction and partial occlusion of inferior vena cava from February 2011 to May 2011 in our hospital (Figure 1). Five cases were males and three were females with the average age of 45.3 years old. All the cases were diagnosed as primary hepatic carcinoma by enhanced computed tomography (CT) and no severe complications of cardiovascular diseases were found among them. The preoperative evaluation showed that the diameter of tumor was 5 to 10 cm; indocyanine green (ICG)-15 min retention rate was less than 10% and the remnant liver volume was more than 40%. Preoperative magnetic resonance cholangiopancreatography (MRCP) showed that there was no obvious variation of the primary and secondary bile duct.

Surgical procedures

All the patients received general anesthesia. A reverse L-form incision was made. Gallbladder was cut off. A blockage was placed at the first hepatic portal. A Peng's multifunctional operational dissectors (PMOD) scalpel was applied to lower the hepatic hilar plate. As there are some small communicating branches in the hepatic hilar plate, electric coagulation was used for hemostasis. Right angle forceps moved downwards along the gap between the hepatic hilar plate and liver, and moved down through the surface serous membrane behind the hepatoduodenal ligament. During the separation process, much attention should be paid to the tiny branches in the caudate lobe from the portal vein. Once these branches are broken, hemorrhage will be very hard to control. After gap separation, Silk 7 for ligation was imbedded. If right liver resection was needed, the right liver pedicle would be ligated, and if left liver resection was necessary, the left liver pedicle would be ligated. For right posterior lobe resection, the pedicle of the right posterior lobe was separated from that of the right anterior lobe, ligated, and then Catheter 8 was used to block the pedicle of the right anterior lobe. Instantly after ligation, a distinct semi-liver ischemic line appeared. The serous membrane of the inferior vena cava was opened from above the renal vein. The inferior vena cava was isolated with right angle forceps. Catheter 8 was used to go around the inferior vena cava one circle, and gradually drawn tightly until the blood back that flow from the hepatic vein basically stopped when the central venous pressure decreased to $3H_20$ cm. A PMOD scalpel was used for liver resection. The time for the first blockage of the inferior vena cava was 5 min and then 10 min for each. The time for semi-liver resection was 30 to 45 min (the fastest resection could not be less than 15 min), and there was no hemorrhage on the section during the surgery, basically.

RESULTS

Among eight patients, three underwent right liver resection (RLR), two underwent left liver resection (LLR) and the other three underwent right posterior lobe resection (RPLR). The operation time was 60 to 90 min

with the average blood loss of 100 to 200 ml. There were no significant differences in aspartate transaminase (AST) or alkaline phosphate (ALP) before and after operation. The albumin decreased by about 10 g after operation. Ascites occurred in all cases after operation, but after infusion of albumin, diuretics disappeared, and enterocinesia was restored two days later.

DISCUSSION

Liver can be divided into three lobes according to different peduncular running directions, left lobe, mid lobe and right lobe, and each lobe has its own pedicle. The pedicles of different lobes can be isolated by lowering the hepatic hilar plate outside the liver, based on which the blood flow of the needed hepatic lobe can be completely blocked. As compared to other methods used for liver resection, this method possesses a lot of advantages. It is easily operated with a more accurate blockage and less hemorrhage during surgery. The resection of the blocked hepatic segment can bring in a more accurate tumor resection and a lower relapse rate after operation. And the obstruction of the pedicle in which tumor exists can reduce the ischemical reperfusion injury after operation, improve liver function recovery and decrease the postoperative complications. However, this method requires a good anatomical knowledge of the hepatic hilar plate. The depression of the hepatic hilar plate might cause hemorrhage, the downward separation of the needed pedicle might damage the tiny branches into the caudate lobe from the portal vein, leading to hemorrhage, and also surgical injury can also be resulted in when there is manifest mutation in the biliary tract.

After the completion of pedicle obstruction, it was found out that hemorrhage on the hepatic section mainly came from the vein. The reason for that mainly lies in the fact that the blockage of the first hepatic portal pedicle could not block the reflux of blood flow from the hepatic vein simultaneously, but such reflux could be reduced through decreasing the central venous pressure (Otsubo et al., 2004; Wang et al., 2006; Magder, 2006; Kato et al., 2008;). Drug method is the most commonly used method for decreasing the central venous pressure at present, but drug method can impose great impacts on the systemic microcirculation. The partial obstruction of the inferior vena cava makes the blood to flow reversely into the right atrium unable to reflow into the retro-hepatic inferior vena cava under the influence of tricuspid valve closure. And this method can decrease the central venous pressure to a minimum of 3 mmHg, which could not only reduce hemorrhage on the hepatic section to a great extent, but have only a little impact on the general circulation (Otsubo et al., 2004; Kato et al., 2008). But the partial obstruction of the inferior vena cava also has its disadvantage, that is, it is intolerable to some senile patients (Smyrniotis et al., 2002).

The combined method of Glission pedicle obstruction And partial obstruction of the inferior vena cava used for regional liver resection, as compared to other methods, has some virtues. Instead of dissociating, respectively the hepatic artery, portal vein and bile duct, it can obstruct the hepatic artery and portal vein outside the Glission sheath by lowering the hepatic hilar plate outside the liver. After blockage, a distinct hepatic ischemic mark can be exhibited, which is beneficial for an accurate lobe resection. After the obstruction of the first hepatic portal, the hemorrhage on the hepatic section mainly arises from the reflux of the hepatic venous blood. The partial obstruction of the inferior vena cava can decrease the central venous pressure to 3 mmHg or so and stop the hemorrhage on the hepatic section (some studies in which the hepatic vein was isolated and blocked alone reported that blood flow increased after the obstruction of the outflow tract). In our study, among eight cases treated with Glission pedicle obstruction combined with partial obstruction of the inferior vena cava for liver resection, the average operation time was 60 to 90 min with an average blood loss of 100 to 200 ml. There were no significant differences in AST and ALP before and after operation. The albumin decreased by about 10 g after operation. Though ascites occurred in all cases after operation, diuretics disappeared, and enterocinesia was restored two days later after infusion of albumin. Compared to other methods adopted at our center, this combined method manifestly shortened the operation time and reduced the blood loss.

However, our study has its limitation. As the number of cases in this study is small, further exploration into the anatomy of intrahepatic Glission pedicles will be needed in the future for the implementation of real hepatic segmentecomy.

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