Pre-ligation of afflicted hepatic inflow and outflow blood vessels of lesioned liver lobe during hepatectomy

Zhe-Fu Li and Min Song

Qingdao, China

OBJECTIVE: To compare the merits of hepatectomy after pre-ligation of the hepatic inflow and outflow blood vessels of the lesioned liver lobe with those of Pringle's maneuver.

METHODS: A total of 68 patients were divided into two groups A and B. In the group A ($n=38$), Pringle's maneuver was employed, whereas in the group B ($n=30$), hepatectomy after pre-ligation of the hepatic inflow and outflow blood vessels of the lesioned side of the liver was used. Perioperative blood loss, postoperative bleeding and drainage, time of liver function recovery as well as incidence of postoperative complications were compared between the 2 groups.

RESULTS: The mean perioperative blood loss, the mean amount of postoperative bleeding and drainage, the time of liver function recovery as well as incidence of postoperative complications were significantly higher in the group A than in the group B ($P<0.01$).

CONCLUSION: Hepatectomy after pre-ligation of the hepatic inflow and outflow blood vessels of the lesioned side of the liver is superior to Pringle's maneuver.

(***HBPD Int 2003; 2: 358-361***)

Key words: hepatectomy; blood flow clamping

Introduction

Decreasing intraoperative blood loss and hepatic ischemic time as far as possible is the key to successful liver operation. Several methods are available for blocking hepatic inflow and outflow blood, but clamping of the porta hepatis may aggravate the damage to the remaining liver function, increase the incidence of postoperative complications, and prolong the time of recovery. In recent 4 years, hepatectomy was performed after pre-ligation of the hepatic inflow and outflow blood vessels of the lesioned side of the liver without clamping of the porta hepatis.

From the Department of Hepatobiliary, Qingdao Municipal Hospital, Qingdao University Medical College, Qingdao 266011, China (Li ZF and Song M)

Correspondence: Zhe-Fu Li, MD, Department of Hepatobiliary, Qingdao Municipal Hospital, Qingdao University Medical College, Qingdao 266011, China (Tel: 86-532-5658687; Fax: 86-532-5658687; Email: lizhefu@public.qd.sd.cn)

Methods

Patients

From August 1998 to August 2002, 68 patients underwent hepatectomy. Classic Pringle's maneuver was used in group A (38 patients: 23 men and 15 women, aged from 36 to 65 years, mean 52.4±10.6 years). Group B (30 patients) was subjected to pre-ligation of the hepatic inflow and outflow blood vessels of the lesioned side without clamping of the porta hepatis. Of the 30 patients, 17 were men and 13 women, aged from 32 to 70 years (mean 53.8±12.1 years). Primary liver cancer was found in 22 patients in group A and 17 patients in group B. Hepatolithiasis was found in 16 patients in group A and 13 patients in group B. Cirrhosis was not detected in 18 patients in group A

and 13 patients in group B, small node cirrhosis (<3 mm) in 11 patients in group A and 9 patients in group B, large node cirrhosis (>3 mm) in 9 patients in group A and 8 patients in group B. The tumor diameter was calculated according to the largest single tumor resected or the sum of largest diameters of many resected tumors. The diameter ranged from 3 to 12 cm in group A and from 5 to 15 cm in group B. Left hemihepatectomy was performed in 9 patients in group A and in 7 patients in group B; left lateral lobectomy in 12 patients in group A and 8 patients in group B; V or VIII segmentectomy in 6 patients in group A and 5 patients in group B; local hepatectomy in 11 patients in group A and 10 patients in group B.

Surgical procedures

Under continuous extradural and general anesthesia, the patient laid on his back with the raised right side of his body. Right subcostal incision was made for right hepatectomy, bilateral subcostal incision for middle or left hepatectomy, and right rectus abdominal incision extending to the xiphoid for left lateral lobectomy.

Occlusion of left hemihepatic blood

On the left side (0.5–1.0 cm) of the first porta hepatis middle point, the tip of a long curve forceps was stabbed in the parenchyma of the horizontal ditch's upper edge, along the exterior of the left hepatic stem's Glisson's sheath, then inclined down to the left back. The forceps penetrated the boundary where the horizontal ditch's left down edge, venous ligament ditch, and caudate lobe are located. The head of a piece of No. 8 silk suture was clipped and derived from the forceps tunnel to ligate the hepatic stem of the left hemihepatic lobe. After the ligamentum teres was pulled downward and the left side of the second porta hepatis point was exposed, the tip of the forceps was stabbed in the parenchyma about 2.5 cm from the hepatic upper edge or the point adhered by the lateral lobe of the falciform ligament. Finally, the forceps penetrated the rear of the left hepatic lobe and the left side of the posthepatic inferior vena cava. The head of a piece of No. 8 silk suture was clipped and derived from the forceps tunnel to ligate the left hepatic vein.

Blocking of left lateral blood vessel

The point of a long curve forceps was stabbed in the parenchyma about 2 cm from the left upper side of the first porta hepatis's horizontal ditch or where the visceral surface on the left side of the ligamentum teres was located. The depth of stabbing was about 1.5 cm along the exterior of the Glisson's sheath down to the left lower side of the horizontal ditch and the left edge of the venous ligament where the forceps penetrated. The head of a piece of No. 8 silk suture was clipped tightly and derived from the forceps tunnel to ligate the left lateral blood vessel and bile duct. The management of the left hepatic vein was similar to left hemihepatectomy.

Blocking of right posterior blood vessel

A vestige extended outside and down from the right side of the porta hepatis horizontal ditch, where the right posterior blood vessels and the bile duct are located. The point of the forceps was stabbed in the vestige about 2.0 cm from the horizontal ditch's upper edge, then went backward and down to encircle arc-shapedly the posterior blood vessels and bile duct stem. The point of the forceps penetrated from the parenchyma of the vestige lower edge and opened slightly to clip a piece of silk suture, which was withdrawn along the forceps tunnel and tightened to ligate the right posterior inflow blood vessels and bile duct stem. The right hepatic vein was identified at the right edge of the second porta hepatis, where the point of the forceps was stabbed in, and the right hepatic vein was ligated with a piece of No. 8 silk suture.

Division of liver parenchyma

Finger or scalpel handle was applied to separate the parenchyma, and forceps fracture was adopted to transect the parenchyma in patients with obvious liver cirrhosis. The row surface of the liver was closed by mattress suture. The porta hepatis was occluded with Pringle's maneuver, with an intermittent interruption of less than 20 minutes.

Table. Comparison of clinical results between the two groups

Variables	Group A	Group B	$P<$
Liver function (Child's classification)	A-B	A-B	
Operative scope	Segmentectomy, combined segmentectomy	Segmentectomy, combined segmentectomy	
Preoperative total bilirubin (mg)	<2	<2	
Tumor size (cm)	3-12	5-15	
Site of lesions (segment)	II-VI, VIII	II-IV, VI, VIII	
Mean intraoperative blood loss (ml)	850(400-1500)	450(200-800)	0.01
Mean postoperative bleeding and drainage (ml)	300(200-500)	150(100-300)	0.01
Recovery time of postoperative ALT (d)	6-35	3-7	0.01
Recovery time of postoperative AST(d)	5-30	4-8	0.01
Recovery time of total bilirubin (d)	7-60	5-14	0.01
Postoperative GI tract bleeding (case)	3	0	
Postoperative GI tract bleeding death (case)	2	0	
Postoperative ascites, hydrothorax, subphrenic infection, bile leakage (case)	3	0	

Statistical analysis

The data were compared with χ^2 test. Positive data were compared by Student's t test, otherwise by Wilcoxon test.

Results

Clinical therapeutic results were compared between the two groups (Table). Liver functions were dependent on the values of total bilirubin, ALT and AST. Postoperative complications included GI tract bleeding, death due to GI tract bleeding, ascites, hydrothorax, subphrenic infection, and bile leakage.

Discussion

How to control intraoperative blood loss and alleviate the damage to liver function is the topic that surgeons have discussed for years. Retrograde hepatectomy has been used to deal with huge and refractory liver carcinoma with less postoperative complications than those caused by classic hepatectomy.[1] It is indicated that retrograde hepatectomy is safe and reliable. Others[2] occluded hemihepatic blood to carry out hepatectomy with reserved opposite hemihepatic blood supply, slightly damaged liver function after operation, less complications and quick recovery. Chen et al[3] performed successfully pre-ligation of lesioned inflow and outflow blood vessels without dissection of the porta hepatis during hepatectomy. We used their method in our practice.[4]

The results of this group indicated that perioperative blood loss and volume of postoperative bleeding and drainage were lowered more significantly in group B than in group A. The patients in group B recovered quickly because of non-blockage of the hilum, and less damage to the blood supply to the healthy liver lobe. This was especially true in patients with liver cirrhosis and liver function damage caused by hepatitis before operation. In this group, liver function recovered faster after operation in group B than in group A, and no serious complications such as upper GI bleeding and death occurred. It is obvious that the method is safe and reliable in patients with liver cirrhosis during hepatectomy.

Either transhepatic parenchymal route or in between route of the hepatic capsule and the exterior of the Glisson's sheath can be chosen in preligation of the hepatic inflow blood vessels. We realized that a long curved forceps should take the transhepatic parenchymal route because of its small arc. Hence the forceps can penetrate the parenchyma through the exterior of the Glisson's sheath without resistance, while it is stabbed in the parenchyma 1-2 cm above the projection of the Glisson's sheath on the hepatic surface. The operation

in this way is dependent on the arc degree of the long curved forceps. Stabbing course of the forceps in the parenchyma by another route is extremely difficult because of the small arc degree of the forceps and the trouble in penetrating the parenchyma according to its arc degree in a shortest distance. The angle of the forceps should be changed factitiously in order to accomplish this purpose. Doing this way is likely to break or not encircle the Glisson's sheath, causing massive bleeding, bile leakage and incomplete blockage. Therefore, some surgeons would give up this method. The solution is to use a largely curved forceps to expose the Glisson's sheath by blunt dissection. If the parenchyma is stabbed at a probable position, the variation of anatomy should be emphasized, otherwise the Glisson's sheath will be penetrated.

In stabbing of the parenchyma, several factors need to be stressed. First, the head of a long curved forceps should be sharp and thin for easily piercing. Second, it is necessary to operate gently if there is resistance, or better to withdraw a little bit or choose another point to stab. Third, when blood oozes from the stabbing point, calm is required to complete the operation quickly and derive the No. 8 silk suture to ligate the Glisson's sheath. Fourth, once blockage is not thorough, deep stabbing is advisable at the original point, crossing the Glisson's sheath, to religate with silk suture.

In our group, none of the patients experienced massive bleeding or bile leakage because of breaking of the blood vessel or the bile duct. Inflow blood vessel was not blocked thoroughly in 2 patients, but succeeded at the second attempt. We conclude that being familiar with the anatonical structure of the liver, the operator with operative skills or experience is not difficult to use this procedure to block hepatic inflow blood vessel during hepatectomy. Hence, pre-ligation of the afflicted hepatic inflow and outflow blood vessel is feasible in hepatectomy.

Competing interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References

1 Wu ZQ, Fan J, Zhou J, et al. Retrograde hepatectomy for liver cancer patients: experience in 178 cases. Chin J Gen Surg 2001;16:197-198.
2 Yan LN, Zeng Y, Lin QY, et al. Changes in hepatic energy metabolism during hepatopetal blood occlusion of half liver. Chin J Hepatobiliary Surg 2000;6:10-12.
3 Chen XP, Wu ZD, Qiu FZ. Hepatectomy with preligating pathological side hepatic inflow and outflow blood vessel without dissection of hilum. Chin J Surg 2000;38:391-392.
4 Li ZF, Wang Y, Hu YL. Hepatectomy after preligation of hepatic inflow and outflow blood vessels on pathological side. Chin J Hepatobiliary Surg 2002;8:396-398.

Received August 5, 2002
Accepted after revision March 5, 2003