Surgical excision of giant primary carcinoma in the medial liver lobe

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OBJECTIVE: To assess the techniques for surgical excision of giant primary carcinoma in the medial liver lobe.

METHODS: Operative managements, complications and their causes during and after resection of giant carcinoma in the medial liver lobe were analyzed retrospectively in 166 cases treated from October 1996 through December 2001.

RESULTS: Of the 166 patients, 123 (74.1%) underwent tumor resection and 43 (25.9%) regular lobectomy, including left trilobectomy (8, 4.8%), medial lobectomy (21, 12.7%), right anterior lobectomy (11, 6.6%), and hemihepatectomy (3, 1.8%). All patients were subjected to surgery with intermittent interruption of the first porta hepatis under normothermia. The total interruption time was 7–68 minutes and average time was 24.5 minutes. The maximum single interruption time was 41 minutes. Intraoperative blood loss was 50–4000 ml, averaging 726 ml. The maximum blood transfusion was 5200 ml, averaging was 811 ml, and transfusion was not needed in 54 patients. Postoperative complications occurred in 9 patients (5.4%), of whom, 2 (1.2%) died of liver failure and acute respiratory distress syndrome respectively.

CONCLUSIONS: An adequate reserve of liver function is a prerequisite for a smooth recovery after operation. Careful intraoperative management is crucial to decrease postoperative complications.

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Key words: giant primary liver cancer; operation

Introduction

Surgical excision of primary liver carcinoma (PLC) in the medial lobe is extremely difficult because of its special anatomy. Since the first successful medial lobectomy for liver cancer was performed in China by Wu et al[1] in May 1963, the operation has been common at our hospital. However, surgical excision of giant PLC with a diameter ≥10 cm in the medial liver lobe is still a challenge to surgeons for its specific anatomic relation, bulky size and crushing on or invasion to the porta hepatis and inferior vena cava. It remains a problem concerning how to reduce operative mortality and postoperative complications.[2-5]

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Methods

Patients

From October 1996 to December 2001, hepatectomy was performed upon 683 patients with PLC in the medial liver lobe out of 6200 patients with PLC treated surgically at our hospital. Of these patients, 166 were diagnosed as having giant PLC in the medial lobe, including 146 men and 20 women, aged 5–74 years (mean 48.7 years). In

this series, 155 (93.4%) patients were complicated by liver cirrhosis and 111 (66.9%) were AFP positive. Pathological examinations demonstrated that 153 patients had hepatocellular carcinoma, 8 bile duct cell carcinoma, 4 mixed type carcinoma and 1 hepatoblastoma. Tumors larger than 15 cm in diameter were found in 31 patients, the largest being 26 cm. All patients were in class A (<6 points) according to Child-Pugh's classification of liver function.

Operative data

Of the 166 patients, 123 (74.1%) underwent tumor resection and 43 (25.9%) regular lobectomy including left trilobectomy (8; 4.8%), medial lobectomy (21; 12.7%), right anterior lobectomy (11; 6.6%), and hemihepatectomy (3; 1.8%). Surgical resection was done with intermittent interruption of the first porta hepatis under nomothemia. The porta hepatis was interrupted only once in 121 patients, 2 times in 35, and 3 times in 10. The total interruption time was 7-68 minutes, averaging 24.5 minutes. The maximum single interruption time was 41 minutes.

Blood loss during operation was 50-4000 ml, averaging 726 ml. Blood loss was less than 1000 ml in 124 patients, 1000-2000 ml in 33, 2000-3000 ml in 5, and more than 3000 ml in 4. Maximum blood transfusion was 5200 ml, averaging 811 ml, and no transfusion was needed in 54 patients. Blood transfusion was less than 1000 ml in 50 patients, 1000-2000 ml in 46, 2000-3000 ml in 11 and more than 3000 ml in 5. In the 9 patients who received transfusion more than 2000 ml, 6 had a tumor larger than 15 cm in diameter that required extensive dissection or division for resection. The other 3 had tumors closely adjacent to the second porta hepatis or large vessels that resulted in massive blood loss due to rupture of the main trunk of hepatic veins.

In this series, parenchymal transection surface was managed with 3 methods. (1) The left and right surfaces were approximated and closed by direct sutures after thorough hemostasis had been accomplished upon the raw surface in 153 patients (92.2%). Occasionally, gelatin sponges or greater omentum tissues were inserted between the surfaces to eliminate possible dead space prior to appoximation. (2) The transection surface was covered by greater omentum tissues only and thus obliterated in 5 patients (3%). (3) Use techniques described in (1) and (2) in combination, that is, the left and/or right transection surfaces were closed by sutures separately and the rest raw surface was covered by the omentum, gelatin sponges or stanching satin in 8 patients (4.8%).

Results

Nine patients (5.4%) had postoperative complications including liver failure (1), acute respiratory distress syndrome (ARDS) (1), acute renal failure (1), incomplete small intestine obstruction (1), disruption of abdominal wound (1) and bile leakage (4). The four patients with bile leakage were cured within 20, 21, 69 and 101 days after operation respectively. Two patients (1.2%) with liver failure and ARDS died on day 12 and day 13 after operation, respectively.

Discussion

Generally, PLCs are categorized as small or large carcinomas based on whether they are smaller or larger than 5 cm in diameter. Moreover, those larger than 10 cm in diameter are referred to as giant carcinomas. Although the excision of giant liver carcinomas carries a relatively higher operative mortality and postoperative complication rate, the risk of operation has been declining with improvement of operative skills and perioperative management. Our experience has demonstrated that even giant liver carcinomas adjacent to the porta hepatis could be resected safely, with a survival rate of patients being higher than other treatment.[6] We are convinced that surgical excision is the treatment of choice for giant liver carcinoma, even if the tumor is located in the medial lobe of the liver.

Indications for surgical excision

For surgical excision, candidates should meet the following conditions. (1) The patient should

be free from cardiac, pulmonary or renal dysfunction or other severe diseases. (2) The patient should be in Child-Pugh's class A with a normal pre-albumin level and a γ-globulin ratio ≤25%;[7] and be free from esophagogastric varices or severe splenomegaly (CT showed ≤8 rib units). Intraoperative findings like soft or no more than moderately hard liver, brown or dark red, no remarkable hepatic hyperemia and no fatty infiltration are all suggestive of a relatively good liver function. (3) There should be a clearcut boundary between the tumor and liver tissues and the volume of residual liver must be larger than 50% of the original volume after hepatectomy.

Techniques of surgical excision

Incision and operative maneuvers

Mercedes incision is routinely employed for optimal exposure of the second porta hepatis. Intact removal of the tumor is the principle of the operation, though regular lobectomy may be done with caution. If the tumor is located in the left part of the middle lobe and the left lateral lobe is not remarkably enlarged, or, if the tumor is located in the right part of the middle lobe and the left lateral lobe is remarkably enlarged, left or right trilobectomy may be performed with radical resection of the tumor and advantage of only one transection. When medial lobectomy is performed, the left-sided parenchymal transection located 0.5 cm to the right of the left scissura (falciform ligament) will provide good visulization of the main trunk of the left hepatic vein and the pars umbilicalis of the left portal vein. Similarly, the right-sided parenchymal transection located 0.5 cm to the left of the right scissura may also allow for good exposure of the main trunk of the right hepatic vein. Thereby, the risk of injury to these great vessels may be minimized. When dissecting structures at the right notch of the porta hepatis, the Glisson capsule should be left intact so as to prevent injury to the vessels and bile ducts that run into the right posterior lobe of the liver. Ligation of the medial hepatic vein should be done as far away from the confluence of the medial and left hepatic veins as possible, which will significantly reduce injuries to the common trunk of the two vessels. Dividing the liver tissues of the medial lobe is advisable to start from the posterosuperior aspect and the lateral aspect. Then the detached part of the liver is inverted to expose the vessels and ducts and the liver tissues at the first porta hepatis, which are meticulously divided and handled with ligature or transfixion as necessary.

Control of intraoperative bleeding

Intermittent interruption of the first porta hepatis under normothermia was routinely employed during transecting the liver tissues. The time of single porta hepatis interruption was kept under 20 min. However, if a patient has only mild cirrhosis, the interruption time may be extended as appropriate to decrease intraoperative bleeding. The longest time of single interruption in this group was 41 min and the patient recovered unenventfully after operation.

Management of the first porta hepatis

In order to avoid injury to the portal vein and hepatic ducts, deep puncture into the liver tissues should be prevented when placing sutures on the transection surface. If the liver tissues upon the large vessels and ducts are too thin, gelatin sponges or greater omentum tissues may be filled between the transection surfaces to play a pressure haemostasis role before they are approximated by shallow suture.

Management of parenchymal transections

The parenchymal transection surfaces should be approximated and closed by direct sutures to eliminate dead spaces on the premise that the first and the second porta hepatis are free from compression. If the branches of the portal and hepatic veins or bile ducts are exposed upon the transection surface, the above-mentioned method may be undesirable for the risk of circulation disturbance and bile drainage impairment in the residual liver. In this situation, the greater omentum may be used to cover the raw surface after thorough haemostasis and control of bile leakage. For transection surfaces which may give high tension after approxima-

tion in entirety, partial approximation and closing is recommended and followed by covering the residual surface with the omentum, gelatin sponges or stanching satin. Before closing the abdomen, it is advisable to double check the liver again for possible pitfalls such as swelling and congestion of the residual liver or distention of the infra-hepatic inferior vena cava, which suggest excessively deep or tight sutures upon the second porta hepatis or transposition of the liver after tumor removal. Should anything be found, causes of the findings must be carefully examined and appropriate management should be given.

Management of satellite focal lesions

Focal manipulation (focal excavation, alcohol injection, microwave heat therapy, etc) is the mainstay for the treatment of satellite focal lesions. Injury to the residual liver should be minimized.

Postoperative bile leakage and its treatment

The incidence of bile leakage is relatively high after excision of giant PLC in the medial lobe. The main causes are: (1) the tumor is huge in size and close to the first porta hepatis; (2) some small biliary ducts may be left unligated.

To prevent bile leakage, the following aspects should be observed. First, vessels and tubes at the first porta hepatis should all be carefully ligated. Second, after thorough haemostasis, the transection surface should be washed with distilled water and then covered by a dry white pad of gauze. Several minutes later, the gauze is removed and inspected. If it is yellow-stained anywhere on it, there must be bile leakage on the raw surface and ligation or transfixion of the small biliary ducts is essential. Third, methylene blue perfused retrogradely through the cystic duct as a tracer can be used to examine the raw surface for blue-stained sites, which indicates bile leakage right there.

If bile leakage is found postoperatively, drainage is the most important thing and supportive treatment is also needed. Drugs like somatostatin are usually used. Type B ultrasonic studies and endoscopic retrograde cholangiopancreatography (ERCP) are helpful in recognizing the causes of bile leakage and guiding therapy.

In this group, two of the four patients with bile leakage were cured with drainage and supportive treatment within 20 and 21 days after operation, respectively. In the third patient, bile drainage was 200–400 ml/day for 3 weeks, suggesting bile leakage from some large biliary duct and constriction at the inferior end of the common bile duct. This was confirmed by ERCP later. By using ENBD technique, the patient was cured on the 69th day after operation. The fourth patient was found with intrahepatic cholangiectasis by ultrasonography and obstruction of the common hepatic duct by ERCP, which might be iatrogenic. With intraluminal dilatation and stenting of the stenotic bile, the patient was cured on the 101st day after operation.

Operative death

There were two operative deaths in this group. One patient died from liver failure caused by transcatheter hepatic-arterial chemical embolism (TACE) produced at another hospital a month before operation; abnormal liver function before operation (TBIL 31.3 μmol/l, ALB 37.7 g/l, pALB 7.73 mg/dl, ALT 112 U/L); and extensive operative trauma due to excavation of satellite focal lesions in both left lateral and right posterior lobes. The lessons learned from this case include: TACE should best be avoided before operation if the tumor is resectable,[8] and if TACE has already been done, operation should be postponed until the recovery of liver function.

The other patient died from ARDS caused by massive transfusion, right-sided pneumothorax, and poor liver function reserve. (1) Massive transfusion: the tumor was in segment Ⅷ, and blood loss was 4000 ml and blood transfusion was 5200 ml during operation. (2) Right-sided pneumothorax: because of adhesion between the tumor and diaphragm, partial resection of the diaphragm was performed during operation, which contributed to postoperative pneumothorax. (3) Poor liver function reserve (A/G 37.9/43.3 = 0.9, pALB 14.4 mg/dl, gama-globulin 33.3%). We suggest that first, every effort should be made to improve hepa-

tic function before operation; second, precautions should be taken to the diagnosis and treatment of possible pneumothorax after partial resection of the diaphragm; and third, once ARDS is established, large dose of corticoid should be administered as early as possible and mechanical ventilation is initiated.

In summary, surgical excision of tumors is the treatment of choice for giant PLC in the medial lobe of the liver. For a successful recovery from surgery, adequate preoperative liver function reserve of the patient is of utmost importance. Moreover, parenchymal transections should be appropriately managed using various methods and meticulous attention should be paid to avoid injuries to the large vessels and biliary ducts during operation. Along with these measures, proper perioperative care is also essential to an uneventful convalescence.

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.

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