



Hepatic Resection for Hepatocellular Carcinoma

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Introduction

Hepatocellular carcinoma (HCC), the most common primary liver cancer, is the number two cancer killer in Hong Kong. There are about 1500 new cases per year, and about 1300 patients died of the disease in 2002. The incidence of HCC in Hong Kong is much higher than that in Western countries, and is related to the high incidence of hepatitis B virus (HBV) infection in Southeast Asia. About 10% of the Hong Kong residents are chronic HBV carriers. More than 80% of all HCC in Hong Kong is associated with HBV infection. About 5% of the disease is related to hepatitis C infection, and about 5% is related to alcohol abuse. The etiologies of HCC in the remaining 10% of the patients are related to other less common causes, including metabolic diseases and unknown causes. Hepatic resection remains the treatment of choice that can offer a meaningful chance of long-term survival for patients with HCC. The present review summarises the experience of hepatic resection for HCC at the Department of Surgery of Queen Mary Hospital in Hong Kong.

Preoperative Evaluation And Selection Criteria For Resection

Careful preoperative evaluations of the tumour status and patients' condition are essential for the successful surgical management of patients with HCC. These include chest X-ray, ultrasonography, and helical contrast computed tomography (CT) scan of the upper abdomen. CT scan is considered suitable for assessment of the relationship of the tumour to major hepatic vasculatures, detection of satellite nodules or intrahepatic metastases, tumour invasion to major vessels including the inferior vena cava and the portal vein. Hepatic angiography and magnetic resonance imaging are performed in selected patients with uncertain diagnosis of HCC with CT scan.¹

The usual selection criteria of patients for hepatic resection in terms of tumour status include absence of extrahepatic metastasis and absence of tumour thrombus in the inferior vena cava or main portal vein, although hepatic resection with removal of tumour thrombus in these major vessels has been advocated.² The role of hepatic resection for bilobar HCC is more controversial. Bilobar HCC may represent advanced disease with intrahepatic metastases from one lobe to the contralateral

lobe, or it may represent multifocal HCC derived from multicentric hepatocarcinogenesis. Major hepatic resection in one lobe combined with wedge resection for a smaller lesion in the other lobe is possible in some patients. Alternatively, hepatic resection in one lobe can be combined with local ablation of a smaller lesion in the other lobe using ethanol injection or ablative therapies such as radiofrequency ablation. In a recent study, we have shown that hepatic resection for patients with bilobar HCC resulted in a better survival outcome than nonresectional therapies.³ Therefore, we recommended that hepatic resection should be considered in selected patients with bilobar disease, especially in those patients with a small solitary lesion in the contralateral lobe that is amenable to wedge resection or local ablative therapy.

Attention to the general medical fitness of patients is one of the most important selection criteria for hepatic resection for HCC. The presence of comorbid illness including cardiovascular disease, diabetes or renal function impairment is associated with an increased risk of operative morbidity and mortality.⁴ Since the majority of the patients with HCC have underlying chronic liver disease including cirrhosis, careful assessment of the liver function reserve is important in patient selection for hepatic resection to avoid postoperative liver failure and mortality. Some centres rely mostly on liver biochemistry and Child's classification⁵ in determining the liver function and the associated operative risk. Other centres employ indocyanine green (ICG) clearance test as a quantitative measurement of the liver function status of the patients. Our experience suggested that ICG retention at 15 minutes of less than 14% was identified as the safety limit for major hepatic resection.⁶

Measurement of the volume of the liver remnant by CT volumetry has been shown to be helpful in selecting patients for major hepatic resection.⁷ For patients who require major hepatic resection for HCC, but have inadequate liver remnant volume, preoperative portal vein embolisation can be used in selected patients to induce atrophy of the right lobe of the liver that harbours the HCC, and hypertrophy of the left lobe of the liver.⁸ It allows safer hepatic resection in patients who have a small liver remnant, and helps to minimise the postoperative morbidity and mortality.^{8,9}

Operative Techniques

Bilateral subcostal incision with upward midline extension is sufficient in most circumstances for hepatic resection for HCC. With a self-retaining retractor, the costal arch is pulled up cranially and the entire anterior surface of the liver can be exposed. The use of an ultrasonic dissector is recommended for accurate and safe parenchymal transection of the liver with less operative blood loss and a wider tumour-free resection margin compared with modified finger-fracture technique.¹⁰ A prospective randomised study on 100 patients who underwent major hepatic resection for HCC performed at Queen Mary Hospital has shown that portal inflow occlusion (Pringle manoeuvre) during hepatic resection resulted in less blood loss and better preservation of liver function in the early postoperative period.¹¹

Right or extended right hepatic resection for large HCC represents one of the major challenges to surgeons. Complete mobilisation of the right lobe of the liver with the right hepatic vein controlled outside the liver before parenchymal transection has been a standard or the conventional approach during major right hepatic resection for HCC.¹²⁻¹⁴ This conventional approach was considered essential in reducing the amount of operative blood loss.¹⁵ However, injudicious mobilisation of the liver in the conventional approach may have the theoretical risks of excessive bleeding caused by avulsion of the hepatic vein and caval branches, prolonged ischaemia of the liver remnant from rotation of the hepatoduodenal ligament, iatrogenic tumour rupture, and spillage of cancer cells into the systemic circulation. Alternatively, the anterior approach can be adopted for patients with major right hepatic resection for HCC. The technique involves initial vascular inflow control, completion of parenchymal transection, and complete venous outflow control, before the right lobe is mobilised.^{16,17} It was considered to have beneficial effects in preserving the liver function of the liver remnant by avoiding warm ischaemia of the latter related to pedicle torsion during mobilisation of the huge tumour. A retrospective study on 160 patients with large right lobe HCC has shown that the anterior approach technique was associated with significantly less intraoperative blood loss and blood transfusion, a lower hospital death rate, and better disease-free and overall survival outcomes.¹⁷

Traditionally, abdominal drain is routinely inserted into the subphrenic or subhepatic space close to the resection surface in patients who undergo hepatic resection. This serves to release the intraabdominal tension due to ascitic fluid accumulation, and allows the monitoring of the occurrence of postoperative intraabdominal bleeding, as well as the detection and drainage of any bile leakage. Two recent prospective randomised trials showed that minor hepatectomy¹⁸ or major hepatectomy for a normal liver¹⁹ is safe without abdominal drainage. In a prospective randomised study, 104 patients who had underlying chronic liver diseases were randomised to have either closed suction abdominal drainage or no drainage after elective

hepatic resection. A significantly higher overall operative morbidity in the drainage group was observed. This was related to a significantly higher incidence of wound complications in the drainage group compared with the non-drainage group (62% vs. 21%, $P < 0.001$). In addition, there was a trend toward a higher incidence of septic complications in the drainage group (33% vs. 17%, $P = 0.07$). The postoperative hospital stay of the drainage group was also significantly longer than that of the non-drainage group (12.5 ± 1.1 days, $P = 0.005$).²⁰ As a result, abdominal drainage after hepatic resection for HCC is not recommended.

Operative Outcomes

About a decade ago, hepatic resection was considered a risky operation with a high operative blood loss and operative mortality. More than 95% of the patients received blood transfusion and hospital mortality rate was as high as 10%, especially in patients with liver cirrhosis. With careful operative and perioperative management, hepatic resection has become a relatively safe operation, and a zero-operative mortality has been reported from our centre.¹ Operative blood loss has significantly decreased in recent years, and blood transfusion is relatively uncommon. More than 90% of the patients who underwent hepatic resection for HCC did not require blood transfusion in recent years (Figure 1). Our study showed that avoidance of blood transfusion contributed significantly to better survival outcomes of patients with HCC undergoing liver resection.²¹ A recent review of our experience showed that the 3-year and 5-year survival rates of patients who underwent hepatic resection for HCC were 62% and 50%, respectively.

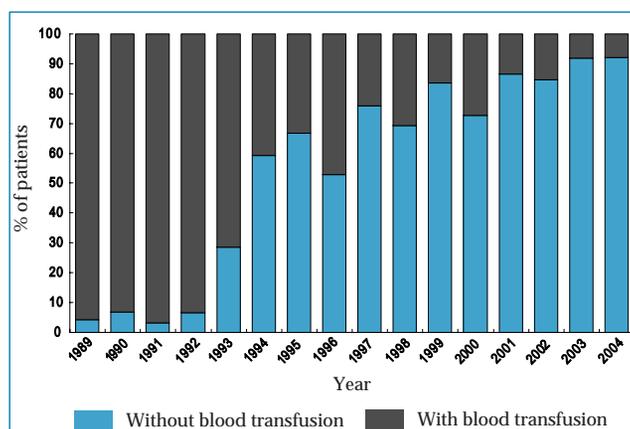


Figure 1. Proportions of patients who underwent hepatic resection for hepatocellular carcinoma at Queen Mary Hospital with or without blood transfusion from 1989 to 2004.

Summary

With recent advances including more accurate preoperative evaluation, improved perioperative care and improved operative techniques, satisfactory results of hepatic resection for HCC with low operative mortality and good long-term survival outcomes have been achieved.



References:

1. Fan ST, Lo CM, Liu CL, Lam CM, Yuen WK, Yeung C, Wong J. Hepatectomy for hepatocellular carcinoma: toward zero hospital deaths. *Ann Surg* 1999; 229:322-330.
2. Nonami T, Nakao A, Harada A, Kaneko T, Kurokawa T, Takagi H. Hepatic resection for hepatocellular carcinoma with a tumor thrombus extending to inferior vena cava. *Hepatogastroenterology* 1997; 44:798-802.
3. Liu CL, Fan ST, Lo CM, Ng IO, Poon RT, Wong J. Hepatic resection for bilobar hepatocellular carcinoma: is it justified? *Arch Surg* 2003; 138:100-104.
4. Miyagawa S, Makuuchi M, Kawasaki S, Kakazu T. Criteria for safe hepatic resection. *Am J Surg* 1995; 169:589-594.
5. Pugh RN, Murray-Lyon IM, Dawson JL, Pietroni MC, Williams R. Transection of the oesophagus for bleeding oesophageal varices. *Br J Surg* 1973; 60:646-649.
6. Fan ST, Lai EC, Lo CM, Ng IO, Wong J. Hospital mortality of major hepatectomy for hepatocellular carcinoma associated with cirrhosis. *Arch Surg* 1995; 130:198-203.
7. Kubota K, Makuuchi M, Kusaka K, Kobayashi T, Miki K, Hasegawa K, Harihara Y, Takayama T. Measurement of liver volume and hepatic functional reserve as a guide to decision-making in resectional surgery for hepatic tumors. *Hepatology* 1997; 26:1176-1181.
8. Farges O, Belghiti J, Kianmanesh R, Regimbeau JM, Santoro R, Vilgrain V, Denys A, Sauvanet A. Portal vein embolization before right hepatectomy: prospective clinical trial. *Ann Surg* 2003; 237:208-217.
9. Azoulay D, Castaing D, Krissat J, Smail A, Hargreaves GM, Lemoine A, Emile JF, Bismuth H. Percutaneous portal vein embolization increases the feasibility and safety of major liver resection for hepatocellular carcinoma in injured liver. *Ann Surg* 2000; 232:665-672.
10. Fan ST, Lai EC, Lo CM, Chu KM, Liu CL, Wong J. Hepatectomy with an ultrasonic dissector for hepatocellular carcinoma. *Br J Surg* 1996; 83:117-120.
11. Man K, Fan ST, Ng IO, Lo CM, Liu CL, Wong J. Prospective evaluation of Pringle maneuver in hepatectomy for liver tumors by a randomized study. *Ann Surg* 1997; 226:704-711.
12. Blumgart LH, Jarnagin WR, Fong Y. Liver resection for benign diseases and for liver and biliary tumors. Blumgart, L. H. Surgery of the liver and the biliary tract. 3rd ed. 1639-1713. 2000. London, WB Saunders.
13. Fortner JG, Kim DK, Maclean BJ, Barrett MK, Iwatsuki S, Turnbull AD, Howland WS, Beattie EJ Jr. Major hepatic resection for neoplasia: personal experience in 108 patients. *Ann Surg* 1978; 188:363-371.
14. Starzl TE, Bell RH, Beart RW, Putnam CW. Hepatic trisegmentectomy and other liver resections. *Surg Gynecol Obstet* 1975; 141:429-437.
15. Makuuchi M, Yamamoto J, Takayama T, Kosuge T, Gunven P, Yamazaki S, Hasegawa H. Extrahepatic division of the right hepatic vein in hepatectomy. *Hepatogastroenterology* 1991; 38:176-179.
16. Lai EC, Fan ST, Lo CM, Chu KM, Liu CL. Anterior approach for difficult major right hepatectomy. *World J Surg* 1996; 20:314-317.
17. Liu CL, Fan ST, Lo CM, Tung-Ping PR, Wong J. Anterior approach for major right hepatic resection for large hepatocellular carcinoma. *Ann Surg* 2000; 232:25-31.
18. Belghiti J, Kabbej M, Sauvanet A, Vilgrain V, Panis Y, Fekete F. Drainage after elective hepatic resection. A randomized trial. *Ann Surg* 1993; 218:748-753.
19. Fong Y, Brennan MF, Brown K, Heffernan N, Blumgart LH. Drainage is unnecessary after elective liver resection. *Am J Surg* 1996; 171:158-162.
20. Liu CL, Fan ST, Lo CM, Wong Y, Ng IO, Lam CM, Poon RT, Wong J. Abdominal drainage after hepatic resection is contraindicated in patients with chronic liver diseases. *Ann Surg* 2004; 239:194-201.
21. Poon RT, Fan ST, Lo CM, Ng IO, Liu CL, Lam CM, Wong J. Improving survival results after resection of hepatocellular carcinoma: a prospective study of 377 patients over 10 years. *Ann Surg* 2001; 234:63-70.

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