Major Liver Resection for Large and Locally Advanced Hepatocellular Carcinoma

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Abstract Optimal management of large and locally advanced hepatocellular carcinoma (HCC) remains a clinical challenge especially in patients with chronic liver disease (CLD). We present our experience of major liver resection for large and locally advanced HCC. Prospectively collected data of patients with large and locally advanced HCC who underwent major liver resection between March 2011 and May 2015. The outcome measures of interest were the characteristics of tumor, surgical outcome, and overall as well as disease-free survival. Eighteen patients (14 male) with median age of 59 years (20 to 73 years) with good performance status underwent resection. Fifteen patients were in Child Pugh class A and three in class B. On contrast-enhanced computed tomography (CECT) scan, four patients had lobar/segmental portal vein involvement, two patients had bilobar disease, and one had biliary obstruction. Seven patients underwent extended resection (>5 segments), five right hepatectomy, two modified right hepatectomy, one modified right hepatectomy with wedge resection of segment six, two left hepatectomy, and one left lateral sectionectomy. On histopathology, 12 were solitary and six were multiple, the median tumor diameter was 9 cm (5–18 cm). All 18 patients had R0 resection. Eight patients had cirrhosis, six had fibrosis, and four had chronic hepatitis. Vascular invasion was noticed in 12 and out of these, six had large-vessel embolization. Morbidity

according to Clavien-Dindo class was grades 1–11, grades 2–5, grade 3B-1, and grades 5–1. After a median follow-up of 32 months (6–54 months), the overall survival at 1 and 3 years was 83 and 54 %, respectively. The disease-free survival at 1 and 3 years was 75 and 54 % respectively. In carefully selected patients with large and locally advanced HCC, acceptable perioperative and medium term outcomes can be achieved with major liver resection.

Keywords Hepatocellular carcinoma · Surgical resection · Cirrhosis · Chronic liver disease

Abbreviations

AFP	Alpha-fetoprotein
BCLC	Barcelona Clinic Liver Cancer
CTP	Child-Turcotte-Pugh
CLD	Chronic liver disease
CECT	Contrast-enhanced computerized tomography
ECOG	Eastern Cooperative Oncology Group
HCC	Hepatocellular carcinoma

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Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver and fifth most common cancer in men and seventh in women. [1, 2] There is a wide variation between centers on liver resection in the management of large HCC (>5 cm in diameter) especially in patients with chronic liver disease (CLD). The Barcelona Clinic Liver Cancer (BCLC) staging system gives prognostic stratification of patients with HCC according to the characteristics of the tumor, the liver disease, and the performance status [3]. The

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European Association for the Study of Liver Disease/American Association for the Study of Liver Disease guidelines for management of HCC recommends the BCLC algorithm for management [4, 5]. BCLC staging demonstrated a reliable capacity to categorize patients with different prognosis [6–9]. However, the BCLC algorithm may be too conservative in offering resection for large and locally advanced HCC. There are studies which have reported favorable outcomes with resection in this group of patients. [10–16] The aim of the study was to review the clinical and pathological data and outcome for major liver resections performed for large and locally advanced HCC.

Patients and Methods

Eighteen patients who underwent major liver resection for large and locally advanced HCC at the department of Liver Transplantation and Hepato-Pancreatico-Biliary surgery, Institute of Liver and Biliary Sciences, New Delhi, India, from March 2011 to May 2015, were included in the study. Large HCC was defined as maximum tumor diameter of 5 cm or more on histopathology. HCC was considered as locally advanced as per stage C of BCLC system (macrovascular invasion, multinodular tumor, bilobar tumor, and symptomatic tumor) without any extra hepatic disease. Clinical performance status was assessed and graded according to the Eastern Cooperative Oncology Group (ECOG) scale. [17] Preoperative diagnosis of HCC was based on either contrast-enhanced computerized tomography scan (CECT) or magnetic resonance imaging. Positron emission tomography scan was done in all patients to rule out extra hepatic disease. Alpha-fetoprotein (AFP) levels were checked preoperatively. Child-Turcotte-Pugh (CTP) score was calculated. The etiology of underlying CLD was evaluated. Clinically significant portal hypertension was considered by indirect clinical parameters (esophageal varices and/or splenomegaly associated with platelet count $<10^9/L$). All the patients were evaluated for the presence of esophageal varices on upper gastrointestinal endoscopy. The tumor-free total liver volume was calculated by CT volumetric analysis. The cutoff value of 40 % remnant liver volume was considered adequate in the presence of cirrhosis and 30 % in the absence of cirrhosis. None of the patients received downstaging or neoadjuvant therapy before surgery. Liver resections were performed by either conventional or anterior approach. Parenchymal transection was performed by CUSA (Cavitron Ultrasonic Surgical Aspirator, Integra, USA). Other factors analyzed included duration of surgery, operative blood loss, resection margins, vascular invasion (MVI), size of tumor, number of tumors, evidence of chronic liver disease on histopathology, and Edmonson-Steiner grade [18]. Postoperative complications were graded as per Clavien-Dindo classification. [19] Details at follow-up

were recorded for the recurrence of disease or decompensation of CLD. All patients were followed up regularly. Disease-free survival and overall survival were calculated.

Results

Preoperative variables, tumor characteristics, type of resections, and pathological characteristics of 18 patients are summarized in Table 1 (Fig. 1). No patient had extra hepatic disease. Five patients were ECOG performance status 1 and remaining 13 patients were status 0. The median AFP level was 8.11 (2.7–62,561). One patient presented with features of obstructive jaundice and a mass lesion in the liver. Preoperative transhepatic biliary drainage was done. This patient underwent right hepatectomy with excision of common bile duct and hepaticojejunostomy. The median operative time was 570 min. (480 to 750 min), and median blood loss was 670 ml (300 to 1450 ml). On the fifth postoperative day, the median serum total bilirubin was 2.8 (0.9 to 11.1 mg %) and median INR was 1.3 (1.1 to 1.8). The median ascites drainage was 575 ml (50 to 4020 ml). The median postoperative hospital stay was 12 days (8–22 days).

Postoperative outcome was classified according to the Clavien-Dindo classification. Sixteen patients recovered well without a need of any invasive therapy (Clavien class I 62 % and class II 28 %). One patient suffered from herniation of small bowel loop through the abdominal drain site and required emergency surgery (Clavien class IIIB). One patient died because of fungal respiratory infection (Clavien class V 5.5 %). One patient died after 2 weeks of discharge from the hospital for unknown reason. The surviving patients were followed up regularly. Seven out of 16 patients had tumor recurrence. Most patients, post resection, were considered for adjuvant sorafenib and those who were started on sorafenib were either intolerant or found it expensive to continue beyond 4 weeks. The tumor recurrence was at 4, 5, 6, 12, 16, 18, and 30 months after the surgery. Three patients with recurrent disease expired and two patients are receiving radio-frequency ablation therapy. After a median follow-up of 32 months (range, 6–54 months), the overall survival at 1 and 3 years was 83 and 54 %, respectively. The disease-free survival at 1 and 3 years was 75 and 54 %, respectively (Fig. 2).

Discussion

The current series is first of its kind from India presenting results of major liver resection for large and locally advanced HCC. The overall survival has been extremely good in the context of disease burden with acceptable perioperative morbidity and mortality and compares well with the published

Table 1 Preoperative variables, tumor characteristics, type of resections, pathological characteristics and follow up

Sr. No.	Age/sex	CTP	CSP	Tumor characteristics	Type of resection	Size (cm)	Nodes	Grade	Liver parenchyma	MaVI	MVI	Follow up (months)	Recurrence (months)	Status
1	20/M	7	N	Multiple nodules in left lobe and nodule in segment 6	Left hepatectomy with caudate lobectomy with wedge resection of segment 6	7	Multiple	2	Cirrhosis	No	No	33	18	Died
2	40/M	6	Y	Right lobe tumor with right portal vein thrombus	Right hepatectomy with right portal veinoplasty	9	Multiple	2	Cirrhosis	Yes	Yes	6	6	Died
3	52/M	9	N	Right lobe tumor with biliary invasion	Extended right hepatectomy with caudate lobectomy with hepaticojunostomy	5	Solitary	2	Cirrhosis	Yes	Yes	54	No	Alive
4	71/M	5	N	Right lobe tumor	Right hepatectomy	9.5	Solitary	2	Cirrhosis	No	No	33	16	Died
5	51/F	5	N	Right lobe tumor	Modified extended right hepatectomy	14	Solitary	2	Fibrosis	No	No	42	30	Alive
6	58/M	5	N	Caudate lobe tumor	Extended right hepatectomy with caudate lobectomy	7	Multiple	2	Cirrhosis	No	Yes	42	No	Alive
7	72/M	5	N	Right lobe tumor	Modified extended right hepatectomy with caudate lobectomy	17	Multiple	2	NASH	No	Yes	–	–	Died
8	71/M	5	N	Right lobe tumor	Right hepatectomy	18	Solitary	2	Chronic Hepatitis	No	Yes	–	–	Died
9	49/F	5	N	Right lobe tumor	Modified extended right hepatectomy with caudate lobectomy	14	Solitary	2	Chronic Hepatitis	Yes	Yes	37	10	Alive
10	45/M	5	N	Right lobe tumor	Right hepatectomy	6.5	Solitary	2	Fibrosis	No	No	35	No	Alive
11	63/M	5	N	Right lobe tumor	Modified right hepatectomy (segment 5, 6, 7)	13	Solitary	2	Cirrhosis	No	Yes	34	No	Alive
12	60/M	7	N	Right lobe tumor	Right hepatectomy	12	Solitary	2	Fibrosis	Yes	Yes	30	No	Alive
13	65/F	5	N	Left lobe tumor	Left lateral sectionectomy	9	Solitary	2	Fibrosis	No	No	28	No	Alive
14	51/M	5	N	Right lobe tumor	Modified right hepatectomy (segment 6, 7 and 8)	6	Solitary	2	NASH	No	Yes	27	No	Alive
15	71/F	5	N	Left lobe tumor	Extended left hepatectomy	13	Multiple	3	Cirrhosis	Yes	Yes	26	4	Alive
16	55/M	5	N	Right lobe tumor with nodule in segment 3	Modified right Hepatectomy (segment 5, 6, 7) and wedge resection of segment 3 lesion	8	Multiple	2	Fibrosis	No	Yes	22	No	Alive
17	60/M	5	N	Right lobe tumor	Right hepatectomy	5.5	Solitary	3	Fibrosis	Yes	Yes	13	No	Alive
18	73/M	5	Y	Left lobe tumor	Left hepatectomy	5.5	Solitary	3	Cirrhosis	No	Yes	9	5	Alive

CTP Child-Turcotte-Pugh score, CSP clinically significant portal hypertension, MaVI macrovascular invasion, MVI microvascular invasion, M male, F female

Fig. 1 **a** CECT of a 59-year-old male patient with liver cirrhosis with a large HCC involving the caudate lobe (white arrow). He underwent extended right hepatectomy with caudate lobectomy. **b** The right lobe of liver with caudate are mobilized off the inferior vena cava and the right hepatic vein is looped. **c** Hilar dissection showing right hepatic artery (red sling) anterior and posterior branches of right portal vein (blue sling) and common bile duct (yellow sling). The tip of forcep is

showing the caudate lobe tumor. **d** The remnant liver after extended right hepatectomy with caudate lobectomy. **e** Resected specimen of extended right hepatectomy with caudate lobectomy. **f** CECT image at 3 years of follow-up. IVC inferior vena cava, RHV right hepatic vein, RAPV right anterior portal vein, RPPV right posterior portal vein, RHA right hepatic artery, CBD common bile duct

literature [15]. Selection of patients for major liver resection for HCC demands careful evaluation. The key factors that determine the outcome are patients performance status, the degree of underlying liver disease (as assessed by the presence of portal hypertension; CTP score), stage of disease, and feasibility of safe resection (safe liver remnant as assessed by volumetry).

The degree of portal hypertension has been shown to correlate with morbidity and mortality [20, 21]. In our series of 18 patients, eight patients had liver cirrhosis, six patients had

fibrosis and four patients had chronic hepatitis. We relied on surrogate markers of evaluating portal hypertension such as CTP score, presence of ascites, platelet count, esophageal varices, or splenomegaly, as objective measures of portal hypertension, such as the hepatic venous pressure gradient, are unreliable in patients with large tumors. Three of our patients were child B and two had clinically significant portal hypertension. The perioperative outcome of the patients with clinically significant portal hypertension was not different from the other patients in the series.

Fig. 2 **a** Overall survival and **b** disease-free survival of patients who underwent major liver resection for large and locally advanced hepatocellular carcinoma

Hepatic resection and liver transplantation are considered the only curative treatment options for HCC and also offer the best long-term disease-free survival [5, 15]. Liver transplantation is limited by organ shortage, and there are ethical concerns in transplanting patients with large and locally advanced HCC as recurrence rates are high. Long-term survivals have been reported in large series following liver resection for HCC. Multiple studies have reported on long-term survival data in patients who underwent resection for large HCC (>10 cm) [11, 16, 22–27]. The reported 5-year survival for patients with large HCC, who underwent resection, in these studies ranged from 19 to 39 %. In the current series, the overall survival at 3 years is 54 % which compares well with published literature. The disease recurrence was observed in seven patients. There were four patients who had recurrence within 1 year of resection. The disease-free survival at 1 and 3 years was 75 and 54 % respectively.

Multinodularity and vascular invasion is a prognostic factor which influences recurrence and survival, but this should not preclude resection as long as it is technically feasible. There are studies that have reported favorable 5-year survival between 24 and 60 % after resection in multinodular HCC [14, 28, 29]. In our series, one third of patients had multinodular tumors. The recurrence rate in this subgroup was 40 % (median follow-up 26 months), while the 1-year overall survival was 66 %. The patients with solitary tumors, after a median follow-up of 33 months (9–54), had a recurrence of 18 % at 1 year while the overall survival was 82 %. In the current series, macrovascular invasion was seen in six patients, 50 % of these patients developed recurrence at 1 year. On the contrary, in the patients without macrovascular invasion, there was only 10 % recurrence at 1 year. This survival is superior to what is usually reported for other therapies such as RF ablation and TACE according to BCLC staging system.

In the current series, all patients had tumor larger than 5 cm with background liver disease. Ten of these patients had either multinodularity or macrovascular invasion which will classify them to BCLC B/C stage. According to BCLC stage, these patients will be offered palliative therapy. But the current results clearly shows that in carefully selected patients, hepatic resection can provide good medium term survival. There is controversy in literature whether solitary lesion more than 5 cm should be classified as BCLC B or A, especially between the eastern and western group [15, 30]. In the light of our results, which are in line with considerable body of evidence in published literature, we would suggest that the BCLC algorithm should be used cautiously.

To extend the benefit of liver transplantation for treatment of HCC, downstaging with locoregional therapies (resection/ablation/TACE) has been offered to selected patients initially presenting with HCC beyond conventional criteria (usually Milan or UCSF) for transplantation. Successful downstaging can select those patients with favorable tumor biology to

receive liver transplantation with survival benefit [31]. However, there is no consensus for the definition of downstaging, standardized protocol, and assessment of response. [32]. While there is evidence to suggest that downstaged patients have equivalent survival as compared to patients transplanted primarily, this outcome probably is determined by tumor biology rather than the downstaging per se [31]. Only one third of the patients who undergo resection will ultimately be candidates for salvage liver transplantation [33]. Patients with favorable tumor profile, long recurrence-free interval will be good candidates. When it comes to living donor liver transplantation for HCC, balancing donor risk with recipient outcomes (overall and recurrence-free survival) is important. We use UCSF criteria to select patients for liver transplantation. We do believe that patients who have been successfully downstaged can be considered for transplantation. In our experience, we have not yet come across such a situation.

The current study suggest that patients with good performance status, child's A/early B and technically resectable HCC with good remnant can be offered resection. The data shows that even patients with multinodular tumors or macrovascular invasion may also be carefully selected for resection with outcomes far superior to the next best treatment modality, which is usually palliative. [15, 34] The majority of patients who have undergone resection would not be considered ideal candidates for resection based on current guidelines. The study suggests that selection criteria for resection may be modestly expanded without compromising outcomes.

In conclusion, in carefully selected patients with large and locally advanced HCC, liver resection can be performed with acceptable perioperative morbidity achieving good medium term survival. When offering resection in patients with HCC, size, multinodularity or segmental venous, and presence of cirrhosis should not be a contraindication.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

References

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM (2010) Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer* 127:2893–2917
2. Sherman M (2010) Epidemiology of hepatocellular carcinoma. *Oncology* 78:7–10
3. Llovet JM, Brú C, Bruix J (1999) Prognosis of hepatocellular carcinoma: the BCLC staging classification. *Semin Liver Dis* 19:329–338

4. Bruix J, Sherman M, Llovet JM, Beaugrand M, Lencioni R, Burroughs AK, et al. (2001) Clinical management of hepatocellular carcinoma. Conclusions of the Barcelona-2000 EASL conference. European Association for the Study of the liver. *J Hepatol* 35: 421–430
5. Bruix J, Sherman M, Practice Guidelines Committee, American Association for the Study of Liver Diseases (2011) Management of hepatocellular carcinoma: an update. *Hepatology* 53:1020–1022
6. Wang JH, Changchien CS, Hu TH, Lee CM, Kee KM, Lin CY, et al. (2008) The efficacy of treatment schedules according to Barcelona Clinic Liver Cancer staging for Hepatocellular carcinoma—survival analysis of 3892 patients. *Eur J Cancer* 44: 1000–1006
7. Pascual S, Zapater P, Such J, García-Herola A, Sempere L, Irurzun J, et al. (2006) Comparison of staging systems to predict survival in hepatocellular carcinoma. *Liver Int* 26:673–679
8. Cillo U, Vitale A, Grigoletto F, Farinati F, Brolese A, Zanusi G, et al. (2006) Prospective validation of the Barcelona clinic liver cancer staging system. *J Hepatol* 44:723–731
9. Marrero JA, Fontana RJ, Barrat A, Askari F, Conjeevaram HS, Su GL, et al. (2005) Prognosis of hepatocellular carcinoma: comparison of 7 staging systems in an American cohort. *Hepatology* 41: 707–716
10. Ng KK, Vauthey JN, Pawlik TM, Lauwers GY, Regimbeau JM, Belghiti J, et al. (2005) Is hepatic resection for large or multinodular hepatocellular carcinoma justified? Results from a multi-institutional database. *Ann Surg Oncol* 12:364–373
11. Pawlik TM, Poon RT, Abdalla EK, Zorzi D, Ikai I, Curley SA, Nagomey DM, et al. (2005) Critical appraisal of the clinical and pathologic predictors of survival after resection of large hepatocellular carcinoma. *Arch Surg* 140:450–457
12. Chirica M, Scatton O, Massault PP, Aloia T, Randone B, Dousset B, et al. (2008) Treatment of stage IVA hepatocellular carcinoma. Should we reappraise the role of surgery? *Arch Surg* 143:538–543
13. Torzilli G, Donadon M, Marconi M, Palmisano A, Del Fabbro D, Spinelli A, et al. (2008) Hepatectomy for stage B and stage C hepatocellular carcinoma in the Barcelona clinic liver cancer classification: results of a prospective analysis. *Arch Surg* 143: 1082–1090
14. Ishizawa T, Hasegawa K, Aoki T, Takahashi M, Inoue Y, Sano K, et al. (2008) Neither multiple tumors nor portal hypertension are surgical contraindications for hepatocellular carcinoma. *Gastroenterology* 134:1908–1916
15. Torzilli G, Belghiti J, Kokudo N, Takayama T, Capussotti L, Nuzzo G, et al. (2013) A snapshot of the effective indications and results of surgery for hepatocellular carcinoma in tertiary referral centers: is it adherent to the EASL/AASLD recommendations? An observational study of the HCC east-west study group. *Ann Surg* 257:929–937
16. Fong Y, Sun RL, Jarnagin W, Blumgart LH (1999) An analysis of 412 cases of hepatocellular carcinoma at a western center. *Ann Surg* 229(6):790–799 discussion 799–800
17. Oken MM, Creech RH, Tormey DC, Horton J, Davis TE, McFadden ET, et al. (1982) Toxicity and response criteria of the Eastern Cooperative Oncology Group. *Am J Clin Oncol* 5:649–655
18. Edmondson HA, Steiner PE (1954) Primary carcinoma of the liver: a study of 100 cases among 48,900 necropsies. *Cancer* 7:462–503
19. Dindo D, Demartines N, Clavien PA (2004) Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 240:205–213
20. Choi SB, Kim HJ, Song TJ, Ahn HS, Choi SY (2014) Influence of clinically significant portal hypertension on surgical outcomes and survival following hepatectomy for hepatocellular carcinoma: a systematic review and meta-analysis. *J Hepatobiliary Pancreat Sci* 21:639–647
21. Tang YH, Zhu WJ, Wen TF (2014) Influence of clinically significant portal hypertension on hepatectomy for hepatocellular carcinoma: a meta-analysis. *Asian Pac J Cancer Prev* 15(4):1649–1654
22. Poon RTP, Fan ST, Wong J (2002) Selection criteria for hepatic resection in patients with large hepatocellular carcinoma larger than 10 cm in diameter. *J Am Coll Surg* 194:592–602
23. Yeh CN, Lee WC, Chen MF (2003) Hepatic resection and prognosis for patients with hepatocellular carcinoma larger than 10 cm: two decades of experience at Chang gung memorial hospital. *Ann Surg Oncol* 10:1070–1076
24. Shrager B, Jibara GA, Tabrizian P, Schwartz ME, Labow DM, Hiotis S (2013) Resection of large hepatocellular carcinoma (>10 cm): a unique western perspective. *J Surg Oncol* 107:111–117
25. Yang LY, Fang F, Ou DP, Wu W, Zeng ZJ, Wu F (2009) Solitary large hepatocellular carcinoma: a specific subtype of hepatocellular carcinoma with good outcome after hepatic resection. *Ann Surg* 249:118–123
26. Lee SG, Hwang S, Jung JP, Lee YJ, Kim KH, Ahn CS (2007) Outcome of patients with huge hepatocellular carcinoma after primary resection and treatment of recurrent lesions. *Br J Surg* 94: 320–326
27. Pandey D, Lee KH, Wai CT, Waghlikar G, Tan KC (2007) Long term outcome and prognostic factors for large hepatocellular carcinoma (10 cm or more) after surgical resection. *Ann Surg Oncol* 14: 2817–2823
28. Portolani N, Coniglio A, Ghidoni S, Giovanelli M, Benetti A, Tiberio GA, et al. (2006) Early and late recurrence after liver resection for hepatocellular carcinoma: prognostic and therapeutic implications. *Ann Surg* 243(2):229–235
29. Wu CC, Cheng SB, Ho WM, Chen JT, Liu TJ, P'eng FK (2005) Liver resection for hepatocellular carcinoma in patients with cirrhosis. *Br J Surg* 92:348–355
30. Bruix J, Reig M, Sherman M (2016) Evidence-based diagnosis, staging, and treatment of patients with hepatocellular carcinoma. *Gastroenterology*. doi:10.1053/j.gastro.2015.12.041
31. Sharr WW, Chan SC, CM L (2014) Section 3. Current status of downstaging of hepatocellular carcinoma before liver transplantation. *Transplantation* 97(Suppl 8):S10–S17
32. Parikh ND, Waljee AK, Singal AG (2015) Downstaging hepatocellular carcinoma: a systematic review and pooled analysis. *Liver Transpl* 21(9):1142–1152
33. Bhangui P, Allard MA, Vibert E, Cherqui D, Pelletier G, Cunha AS, et al. (2016) Salvage versus primary liver transplantation for early hepatocellular carcinoma: do both strategies yield similar outcomes? *Ann Surg* 264(1):155–163
34. Roayaie S, Jibara G, Tabrizian P, Park JW, Yang J, Yan L, et al. (2015) The role of hepatic resection in the treatment of hepatocellular cancer. *Hepatology* 62(2):440–451