

## Experience with major hepatic resections for hepatocellular carcinoma

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**Summary.** Nine major hepatic resections for hepatocellular carcinoma were performed during a period of 2 years and 4 months. HBsAg was positive in six patients, preoperative serum  $\alpha$ -fetoprotein was more than 20 ng/ml in 5 patients, and liver cirrhosis was present in four patients. Two patients presented with spontaneous rupture of hepatocellular carcinoma. The great value of ultrasonography is stressed as an emergency diagnostic tool in any patient with an acute abdomen without obvious cause. There was no operative mortality or morbidity among this series of patients. All but one patient with a ruptured hepatoma are alive without evidence of disease 3–31 months after liver resection. These encouraging operative results made the authors willing to adopt an aggressive policy toward the surgical treatment of hepatocellular carcinoma.

### Introduction

Hepatocellular carcinoma is one of the leading cancers among men in Taiwan, and is responsible for 20% of cancer deaths [5]. Treatment of hepatocellular carcinoma constitutes a challenge to the physician. Recent advances in diagnosis, including  $\alpha$ -fetoprotein monitoring, ultrasonography, and computed tomography, have increased the chances of detecting hepatoma at an earlier stage. Since long-term survival of hepatocellular carcinoma patients cannot be expected with any treatment other than surgery, the therapeutic value of hepatic resection has become more important than ever before.

During a period of 2 years and 4 months, from the opening of the Chang Gung Memorial Hospital at Keelung in April 1985 to August 1987, nine major hepatic resections were performed for hepatocellular carcinoma by the surgeon trained in liver transplantation. There was no operative mortality or morbidity among this series of patients. These encouraging operative results made the authors willing to adopt an aggressive policy toward the surgical treatment of hepatocellular carcinoma.

### Materials and methods

The sample group comprised one female and eight male patients. The ages of the patients ranged from 10 years to

69 years with an average of 48 years (Fig. 1). Four of the nine patients had underlying liver cirrhosis. HBsAg was positive in six patients and serum  $\alpha$ -fetoprotein more than 20 ng/ml in five patients. Tumor size ranged from 4 cm to 11.5 cm with an average of 8.3 cm (Table 1). All of the seven patients with tumors larger than 5 cm underwent formal anatomic resections, five had right lobectomy and two had left lobectomy. Lortat-Jacob's technique was used for all anatomic major resections with preliminary division of inflow vessels and the hepatic duct of the lobe to be removed. The hepatic vein of the lobe to be removed was often divided before liver transection. Parenchymal transection was performed along the exact line of color demarcation. An ultrasonic dissector has been used in cases during the past year.

Complete hemostasis was considered an important factor in preventing postoperative complication. After removal of the specimen, bleeders from the raw surface were individually suture-ligated with 4-0 silk. No effort was made to cover the raw surface with living tissue or with hemostatic materials, such as Gelfoam (absorbable gelatine sponge) or Surgicel (oxidized cellulose). A careful search was made for bile leakage. Intraoperative postresection cholangiography was often used to identify the source of bile leak and duct kinking. T-tubes were not used. However, the subphrenic dead space was drained with 2–3 Jackson-Pratt drains.

Two other patients with tumors of less than 5 cm underwent sublobectomy segmentectomy and are included in this series because of the proximity of the tumors to the hilum, and the underlying cirrhosis which made resections technically difficult. One of the two patients developed a recurrent tumor far away from the resection margin

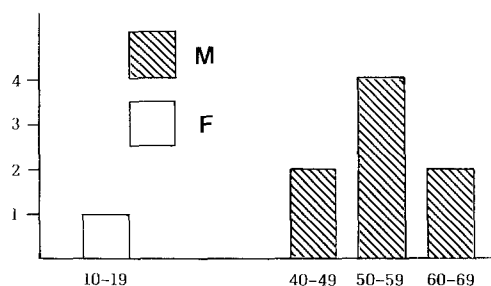


Fig. 1. Age and sex distributions

**Table 1.** Tumor size

Tumor size (cm)	Case no.
<5	2
5-10	4
> 10	3

6 months later and underwent a second resection. Other limited resections of the liver are classified as minor excisions and have been excluded.

## Results

There was no operative mortality or morbidity among this series of patients. It was possible to trace every patient to November 1987. All but one patient with a ruptured hepatoma are alive without evidence of disease 3-31 months after operation.

Of particular interest are the two patients with spontaneous rupture of their hepatomas. The first patient was a 10-year-old girl, who presented in shock with symptoms and signs of an acute abdomen. Ruptured hepatoma was diagnosed in the emergency room by ultrasonography and confirmed by abdominal computed tomography. The serum  $\alpha$ -fetoprotein was >10000 ng/ml by radioimmunoassay and 106200 ng/ml by enzyme immunoassay. The left hepatic lobe along with the attached omentum and a portion of seromuscular layer of the stomach were resected en bloc. Neither chemotherapy nor radiotherapy was employed. Within 3 months, the serum  $\alpha$ -fetoprotein had fallen to <3 ng/ml and has since remained at that level. She has been tumor-free for more than 2.5 years.

The second patient was a 49-year-old man, who presented with an acute abdomen. Spontaneous rupture of a hepatocellular carcinoma was again diagnosed by ultrasonography and confirmed by abdominal computed tomography. Despite the presence of moderately severe cirrhosis, a right hepatic lobectomy was undertaken. On cross-section, there were multiple satellite nodules, besides the underlying cirrhosis. He was doing well until 2 years after liver resection when he developed a solitary brain metastasis. He died shortly after craniotomy with removal of the brain metastasis.

## Discussion

Primary hepatocellular carcinoma is generally considered to be a highly malignant tumor with an extremely poor prognosis. Surgery and complete removal of the primary tumor represent the only realistic chance of long-term survival. However, the resectability rate is low because of a high incidence of associated cirrhosis of the liver or because of the malignant nature of the tumor and invasion of the portal or hepatic veins or spread to the entire liver. Recently, monitoring of the serum  $\alpha$ -fetoprotein levels and ultrasonographic examinations in high-risk patients have made it possible to detect and resect more hepatocellular carcinomas at a relatively early stage.

All nine patients were referred for liver resection from our gastroenterologists or neighboring hospitals. There was no patient whose hepatocellular carcinoma had been detected through a specific mass-screening program in

this series. Accordingly the tumor sizes were relatively large, necessitating major resections despite the presence of concomitant cirrhosis. Although cirrhosis is known to be associated with a high postoperative mortality and morbidity [7, 8], we do not regard it as a contra-indication to resection provided that the patient is metabolically fit, with reasonable hepatic functional reserve. There was no operative mortality or morbidity in this series of patients indicating that major hepatic resections for large hepatocellular carcinoma can be safely undertaken in selected patients with liver cirrhosis.

The high resectability indicates that we have adopted an aggressive policy for the surgical treatment of hepatocellular carcinoma.

Reoperation for recurrent tumor was performed in one patient, and was detected 6 months after the first operation at a location far away from the resection margin. A metachronous multicentric tumorigenesis might be the cause of recurrence in this patient. As the recurrence rate of hepatocellular carcinoma after resection is high, reoperation will become increasingly important.

The obvious difficulties in preoperative diagnosis of spontaneous rupture of hepatocellular carcinomas are reflected in the report of Ervasti, where all seven patients with ruptured hepatoma died without a correct diagnosis [3], as well as in four cases reported by Arnesjö et al. in none of whom was the diagnosis suspected preoperatively [1].

At this institution, it is the practice to obtain ultrasonography routinely following initial plain abdominal films. This is a screening procedure for all patients who present with an atypical acute abdomen. Ultrasonography can be performed readily in the emergency room without patient preparation. It has the advantage of being non-invasive, clinically reliable and available in all medical centers. Since the adoption of this practice, it has been possible to identify a variety of unsuspected lesions preoperatively. A correct preoperative diagnosis is useful in aiding preoperative treatment and in preparation for major surgery.

An abdominal computed tomography should also be performed to evaluate the precise tumor extent and location. However, from the experience with hepatic vascular dissection in liver transplantation, the senior author does not feel it imperative to do preoperative angiography to delineated the hepatic vascular anatomy, especially in an emergency. A left hepatic artery arising from the left gastric artery is easily visualized in the gastrohepatic ligament lying beneath the left lobe of the liver. A right hepatic artery arising from the superior mesenteric artery can be located by its pulsation posterior to the portal vein and common duct [10]. These anomalies can be identified during careful dissection of the hepatic arteries as an essential first step in any liver resection. The use of angiography is reserved only for answering specific questions of tumor extent and location not resolved by noninvasive methods, such as ultrasonography and computed tomography, and in those patients in whom transcatheter arterial embolization is considered.

The prognosis for patients who have had a ruptured hepatoma is considered to be worse, particularly if the tumor itself becomes necrotic and ruptures [4]. Total extirpation of the tumor provides the only hope for extending survival. Balasegaram reported ten cases of ruptured hepato-

cellular carcinoma, and of those that underwent resection, none survived for more than 6 months [2]. In the series reported by Kuo, all 12 patients were dead within 3 months after the operation [6]. In the series of Ong only two patients survived for more than 6 months [9]. The reported dismal prognosis may be a reflection not only of the malignant nature of the tumor but perhaps, in some instances, the lack of a sufficiently aggressive attack on the tumor. Our two cases show that long-term survival, even with rupture, does occur. The first case remains tumor-free for more than 2.5 years, the second case, who died 2 years after liver resection from brain metastasis, is considered a worthwhile palliation. Now that major hepatic resections can be done quite safely, it is worthwhile to encourage a vigorous surgical approach to ruptured hepatocellular carcinoma, which provides the only hope of improving the otherwise dismal prognosis of these patients.

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