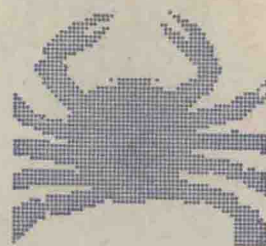


# SELECTED PAPERS ON CANCER

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VOL. 3  
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*Liver Cancer Therapy*



**Selected Papers**  
**on**  
**Cancer**

Vol. 3

**Liver Cancer Therapy**

February 1980

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N 105/2347-3

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肿瘤论文选集 第3卷

(英 5-4/N2347-3)

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## C O N T E N T S

### General

Primary Carcinoma of the Liver.....	1
(The American Journal of Surgery, Vol. 128, pp. 31-36, 1974)	
Management of Primary Liver Cell Carcinoma.....	7
(The American Journal of Surgery, Vol. 130, pp. 33-37, 1975)	
Therapeutic Approaches to Hepatoma.....	12
(Cancer Treatment Reviews, Vol. 2, pp. 73-76, 1975)	
Primary Carcinoma of the Liver.....	16
(Surgery, Gynecology & Obstetrics, Vol. 143, No. 1, 1976)	
The Treatment of Liver Cell Cancer.....	24
(Liver Cell Cancer, Chapter 5, pp. 81-92, Elsevier Scientific Publishing Company, 1976)	
Surgical Treatment of Primary Liver Cell Carcinoma.....	36
(Hepatocellular Carcinoma, Chapter 19, pp. 449-468, John Wiley & Sons, 1976)	
systemic Chemotherapy of Hepatocellular Carcinoma.....	56
(Hepatocellular Carcinoma, Chapter 20, pp. 469-490, John Wiley & Sons, 1976)	
Primary Carcinoma of the Liver.....	77
(Surgery, Vol. 80, No. 3, pp. 322-327, 1976)	
Systemic and Regional Treatment of Primary Carcinoma of the Liver.....	83
(Cancer Treatment Reviews, Vol. 4, pp. 195-212, 1977)	
Highlights in the History of Liver Tumors and Their Resec- tion.....	101
(Solid Liver Tumors, Chapter 2, pp. 9-27, W. B. Saunders Company, 1977)	
Primary Epithelial Cancer in Adults.....	120
(Solid Liver Tumors, Chapter 4, pp. 62-104, W. B. Saunders Company, 1977)	

Palliative Liver Resection to Relieve Symptoms of the Malignant Carcinoid and Other Endocrine Syndromes..... 163  
 (Solid Liver Tumors, Chapter 9, pp. 235-245, W. B. Saunders Company, 1977)

## Operation

Resection of Primary Hepatic Malignant Lesions..... 174  
 (Archives of Surgery, Vol. 108, pp. 599-604, 1974)

Major Hepatic Resection Using Vascular Isolation and Hypothermic Perfusion..... 180  
 (Annals of Surgery, Vol. 180, No. 4, pp. 644-652, 1974)

Vascular Problems in Upper Abdominal Cancer Surgery..... 189  
 (Archives of Surgery, Vol. 109, pp. 148-153, 1974)

Selective Celiac Angiography and Surgical Exploration for Suspected Liver Cancer..... 195  
 (The American Journal of Surgery, Vol. 131, pp. 676-679, 1976)

Angiographic Evaluation of Hepatoma for Surgical Treatment.. 199  
 (Surgery, Gynecology and Obstetrics, Vol. 143, No. 2, pp. 184-190, 1976)

Preoperative Occlusion of the Hepatic Artery with Isobutyl 2-Cyanoacrylate for Resection of the "Unresectable" Hepatic Tumor..... 206  
 (Surgery, Vol. 83, No. 3, pp. 319-322, 1978)

Effect of 5-Fluorouracil on Liver Regeneration and Metabolism After Partial Hepatectomy in the Rat..... 210  
 (Cancer, Vol. 41, No. 2, pp. 435-443, 1978)

Liver Transplantation..... 219  
 (The Lancet, Vol. 2, pp. 29-38, 1974)

Orthotopic Liver Transplantation in Ninety-Three Patients... 229  
 (Surgery, Gynecology and Obstetrics, Vol. 142, No. 4, pp. 487-505, 1976)

## Ligation of Hepatic Artery

- Hepatic Artery Ligation and Cytotoxic Infusion in Treatment of Liver Neoplasms.....248  
(Archives of Surgery, Vol. 110, No. 5, pp. 641-643, 1975)
- Hepatic Dearterialization for Nonresectable Primary and Secondary Tumors of the Liver..... 251  
(Cancer, Vol. 38, No. 6, pp. 2593-2603, 1976)
- Therapeutic Vascular Occlusion Utilizing Steel Coil Technique: Clinical Applications..... 262  
(American Journal Roentgenol, Vol. 127, pp. 381-387, 1976)
- A Method of Intermittent Occlusion and Chemotherapy Infusion of the Hepatic Artery..... 269  
(Surgery, Gynecology and Obstetrics, Vol. 143, No. 1, pp. 107-109, 1976)
- Treatment of Carcinoid Liver Metastases By Hepatic-Artery Embolisation ..... 272  
(The Lancet, Vol. II, No. 8252/3, pp. 1323-1325, 1977)
- Complete Devascularization of Hepatic Lobe with Nonresectable Hepatoma..... 275  
(The American Journal of Surgery, Vol. 134, No. 5, pp. 650-655, 1977)
- Acute Renal Failure After Ligation of the Hepatic Artery.... 281  
(Surgery, Gynecology and Obstetrics, Vol. 143, No. 3, pp. 391-394, 1976)
- Ligation of A Branch of the Portal Vein for Carcinoma of the Liver. .... 285  
(The American Journal of Surgery, Vol. 130, No. 3, pp. 296-302, 1975)
- Regional Chemotherapy
- Arterial Infusion Chemotherapy of Hepatoma..... 292  
(Surgery, Gynecology and Obstetrics, Vol. 138, No. 3, pp. 381-384, 1974)

Complications of Indwelling Chemotherapy Catheters.....	296
(Cancer, Vol. 36, No. 6, pp. 1983-1990, 1975)	
A New Method for Long Term Intrahepatic Chemotherapy.....	304
(Surgery, Gynecology and Obstetrics, Vol. 143, pp. 979-980, 1976)	
肝がんに対する選択的肝動脈内注入化学療法 .....	306
( 手術 Vol. 30, No. 2, pp. 137-155, 1976)	
Intrahepatic Arterial Infusion of Combination of Mitomycin-C and 5-Fluorouracil in Treatment of Primary and Metastatic Liver Carcinoma.....	325
(Cancer, Vol. 39, No. 4, pp. 1425-1429, 1977)	
Intra-arterial Chemotherapy With Concomitant Use of Vaso- constrictors for Liver Cancer .....	330
(Cancer Treatment Reports, Vol. 62, No. 1, pp. 145-146, 1978)	
Palliative Irradiation for Liver Metastases.....	332
(JAMA, Vol. 232, No. 6, pp. 625-628, 1975)	
Irradiation of Hepatic Metastases.....	336
(Int. J. Radiation Oncology Biol. Phys., Vol. 2, No. 1-2, pp. 129-132, 1977)	
転移性肝がんに対する放射線治療経験.....	340
( がんの臨床 Vol. 23, No. 8, pp. 822-830, 1977)	
Chemotherapy	
Regression of Liver Cancer With Oral Urea.....	349
(The Lancet, Vol. 1, No. 7847, pp. 132, 1974)	
Quadruple Chemotherapy Versus Radiotherapy in Treatment of Primary Hepatocellular Carcinoma.....	350
(Cancer, Vol. 40, No. 2, pp. 609-614, 1977)	
長期間生存した原発性肝がん患者の臨床的検討 .....	356
( 肝臓 , Vol. 18, No. 8, pp. 548-553, 1977)	
Oral Fluorouracil Therapy of Hepatoma.....	362
(Cancer, Vol. 39, No. 5, pp. 1930-1935, 1977)	

5-Fluorouracil in Hepatocellular Carcinoma.....	368
(Cancer, Vol. 39, No. 5, pp. 1936-1939, 1977)	
フトラフル坐剤による消化器がんの化学療法 .....	372
( にはんがん治療学会誌 , Vol. 11, No. 3, pp. 535-545, 1976)	
Futrafal Therapy on Liver Cancer.....	383
(Clinical Oncology, Vol. 3, No. 1, pp. 33-49, 1977)	
Treatment of Hepatocellular Carcinoma With Adriamycin.....	400
(Cancer, Vol. 36, No. 4, pp. 1250-1257, 1975)	
Adriamycin Therapy in American Patients With Hepatocellular Carcinoma.....	408
(Cancer Treatment Report, Vol. 61, No. 7, pp. 1385-1387, 1977)	
Adriamycin and 5-Fluorouracil in the Treatment of Advanced Hepatoma: A Southwest Oncology Group Study.....	411
(Cancer Treatment Report, Vol. 61, No. 8, pp. 1595-1597, 1977)	
Induction of Remission in Hepatocellular Carcinoma With Doxorubicin.....	414
(The Lancet, Vol. 1, No. 8072, pp. 1006-1009, 1978)	
A Phase II Study of Adriamycin (NSC 123127) in Patients With Hepatocellular Carcinoma From Zambia and the United States.....	418
(Cancer, Vol. 39, No. 5, pp. 1923-1929, 1977)	
Hepatic Artery Ligation and Adriamycin Infusion Chemo- therapy for Hepatoma.....	425
(Cancer, Vol. 41, No. 4, pp. 1249-1255, 1978)	
Immunostimulation with Intraperitoneally Administered Bacille Calmette Guérin for Advanced Malignant Tumors of the Gastrointestinal Tract.....	432
(Surgery, Gynecology and Obstetrics, Vol. 142, No. 3, pp. 363-368, 1976)	



## Prognostic Index

Alpha Fetoprotein: An Index of Progression or Regression  
of Hepatoma, and a Target for Immunotherapy ..... 438  
(Annals of Surgery, Vol. 180, No. 4, pp. 599-605, 1974)

Evaluation of Hepatoma Chemotherapy by Alpha-Fetoprotein  
Determination..... 445  
(The American Journal of Surgery, Vol. 132, pp. 325-328,  
1976)

Effect of Surgical and Chemotherapeutic Treatment on Alpha-  
Fetoprotein Levels in Patients With Hepatocellular  
Carcinoma..... 449  
(Cancer, Vol. 37, No. 2, pp. 677-683, 1976)

Serum Alpha-Fetoprotein Levels After Hepatic Artery Ligation  
and Postoperative Chemotherapy ..... 456  
(Cancer, Vol. 40, No. 2, pp. 615-618, 1977)

Tumor Vascularity as a Prognostic Factor for Hepatic Tumors. 460  
(Annals of Surgery, Vol. 185, No. 1, pp. 31-34, 1977)

## Liver Tumors in Childhood

Primary Liver Tumors in Infancy and Childhood..... 464  
(Archives of Surgery, Vol. 109, pp. 143-147, 1974)

Current Management of Childhood Solid Tumors..... 469  
(Surgical Clinics of North America, Vol. 56, No. 2,  
pp. 513-535, 1976)

# Primary Carcinoma of the Liver

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Recent diagnostic advances, such as the serologic test for alpha-fetoglobulin, hepatic angiography, and liver scanning, have aided in the earlier diagnosis of primary carcinoma of the liver. Recent acquisitions in knowledge of hepatic anatomy with regard to metabolic and technical considerations have prompted a more aggressive approach to surgical treatment of hepatic tumors, with a much greater chance for a successful outcome.

Only in the past twenty years, however, have a limited number of surgeons been attracted to the problem of hepatic resection for carcinoma of the liver and has a standardized surgical procedure been established due to the pioneering contributions of Honjo and Wangenstein in 1949 and Quattlebaum, Brunschwig, and Lortat-Jacob in 1952, as reviewed by Fineberg, Goldburgh, and Templeton [1] and Foster [2]. Recently, an increase has been reported in the survival rate at five years and at ten years or more after hepatic resection for primary carcinoma of the liver. Ochsner, Meyers, and Ochsner [3] reported on one patient with liver cell carcinoma who survived without recurrence twenty-one years after left lateral segmentectomy. These reports clearly demonstrate that primary carcinoma of the liver is curable when it is localized and resected early.

This paper reviews one experience with seventy-six patients with primary carcinoma of the liver in the past twenty-two years, including one patient who survived seventeen years and five months after left lateral segmentectomy for hepatocellular carcinoma in a cirrhotic liver.

## Clinical Material

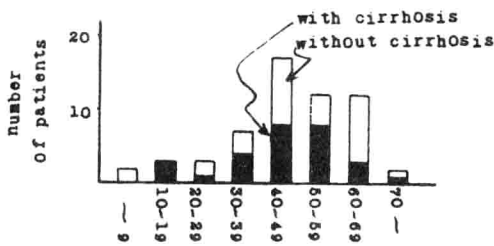
During a twenty-two year period from July 1951 to June 1973, seventy-six patients with histologically proved primary cancer of the liver were admitted to the First Surgical Clinic, Kyoto University Medical School. Our period of study was divided into two parts: July 1951 to June 1962 and July 1962 to June 1973. There were nineteen patients (25 per cent) in the first eleven years and fifty-seven patients (75 per cent) in the second eleven years. Follow-up study was complete in all seventy-six patients.

Of these patients, seventy-one were adults ranging in age from 27 to 75 years, with a mean age of 52.4 years, and five were infants and children of 5.5 months, 8 months, 12 years, 12 years, and 13 years. The ratio of males to females was 3.4:1.

**Pathologic Diagnosis.** Pathologic diagnosis was made from biopsy material obtained at laparotomy in seventy-one patients and from percutaneous needle biopsy in one; the diagnosis was first confirmed at autopsy in four patients. Fifty-seven patients were diagnosed as having hepatocellular carcinoma and included three patients with hepatoblastoma, fifteen with cholangiocellular carcinoma, and four with a mixed type. Of those with cholangiocellular carcinoma, two had histologic findings of

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**Figure 1. Age of patients and the presence of cirrhosis in patients with hepatocellular carcinoma.**

**TABLE I Pathologic Diagnosis**

Type of Carcinoma	Cirrhotic Liver	Noncirrhotic Liver	Total
Hepatocellular	28	29	57
Cholangiocellular	2	13	15
Mixed type	0	4	4
Total	30	46	76

cystadenocarcinoma and one had them originating from polycystic disease of the liver. The average age of adult patients was 49.9 years for those with hepatocellular carcinoma with a peak incidence in the fifth decade (Figure 1), 57.9 years for those with cholangiocellular carcinoma, and 64.3 years for those with the mixed type. All five infants and children had hepatocellular disease.

Of the seventy-six cases, thirty (40 per cent) were clearly associated with cirrhosis: twenty-eight (49 per cent) with hepatocellular carcinoma, two (13 per cent) with cholangiocellular carcinoma, and none with a mixed type. (Table I.)

**Clinical Diagnosis. Symptoms:** Predominant symptoms in this series were abdominal pain (54 per cent), weight loss (41 per cent), and intermittent fever (32 per cent). The longest duration of symptoms before hospitalization was 21 months with a mean duration of 5 months for the entire group, 5.2 months for hepatocellular carcinoma, 4.7 months for cholangiocellular carcinoma, and 6.8 months for the mixed type.

**Physical Findings:** The most common findings were hepatomegaly (92 per cent), a palpable mass (64 per cent), jaundice (20 per cent) at the time of admission, and ascites (46 per cent) noted in thirty-three of seventy-one patients at surgical exploration. There were no significant differences in the incidence of symptoms and physical signs between the cirrhotic and the noncirrhotic patients.

**Laboratory Findings:** Serum bilirubin was elevated in fifteen of seventy-six patients (20 per cent), serum albumin was decreased in twenty-five of sixty-one (41 per cent), prothrombin time was prolonged in twenty-five of fifty-one (49 per cent), anemia was noted in thirty-three of seventy-six (43 per cent), and serum glutamic oxalacetic transaminase was elevated in 79 per cent of the entire group, markedly in those with cirrhosis (96 per cent) and hepatocellular carcinoma (90 per cent). The serologic

ic test for the presence of alpha-fetoglobulin was positive in sixteen of twenty-two patients (73 per cent) with hepatocellular carcinoma.

The unusual symptoms included hypoglycemia (fasting blood sugar of 20 to 30 mg per 100 ml) in two patients and hypercalcemia (serum calcium of 9.2 mEq/L) in one patient, all with hepatocellular carcinoma.

## Treatment

In order to select the suitable candidates for radical resection or palliative procedures, we usually perform surgical exploration for biopsy in most instances. Of the seventy-six patients, therefore, seventy-one underwent surgical exploration; five patients did not because the disease was too advanced and the final diagnosis was established by autopsy or percutaneous needle biopsy.

There were twelve radical resections, eleven palliative resections, eight ligations of the portal branch, seven ligations of the hepatic artery, and thirty-three exploratory laparotomies alone. (Table II.)

A mean duration of symptoms before operation was 3.5 months in patients with radical resection, 5.9 months in those with palliative resection, 7.3 months in those with ligation of the portal branch, 4.6 months in those with ligation of the hepatic artery, and 5 months in those with exploratory laparotomy alone. These figures demonstrate that patients with short duration of symptoms and with early diagnosis are more suitable for radical surgery.

**Hepatic Resection.** Segmental resection was performed by blunt dissection similar to the finger-fracture technic. For lobectomy, a combination of a controlled technic and a finger-fracture technic has been used, since Honjo and Araki [4] successfully performed right hepatic lobectomy for metastatic cancer of the liver with dissection of the porta hepatis and selective vascular and ductal ligation in 1949 in this clinic.

Confusion in nomenclature occasionally occurs in a discussion of major hepatic resection. In this series, right hepatic lobectomy consisted of removal of the entire right lobe with both the anterior and posterior segments; left hepatic lobectomy consisted of removal of the entire left lobe with both lateral and medial segments; extended right hepatic lobectomy included removal of the entire right lobe with a portion of the medial segment of the left lobe.

Of those receiving surgical treatment, hepatic resection was carried out in twenty-three patients (32 per cent); five had extended right hepatic lob-

TABLE II Types of Surgical Treatment

Type of Carcinoma	Hepatic Resection			Portal Branch Ligation	Artery Ligation	Exploration Alone	Total
	Lobar	Segmental	Partial				
Hepatocellular	9	8 (2)*	4 (1)†	5	5	22	53
Cholangiocellular	0	0	1 (1)*	3	2	8	14
Mixed type	0	1 (1)*	0	0	0	3	4
Total	9	9 (3)*	5 (1,1)*†	8	7	33	71

\* Number of patients with both resection and ligation of the portal branch.

† Number of patients with both resection and ligation of the hepatic artery.

ectomy, three had right hepatic lobectomy, one had left hepatic lobectomy, seven had left lateral segmentectomy, one had middle hepatic lobectomy as described by Pack and Miller [5], one had anterior segmentectomy as described by McBride and Wallace [6], and five had partial resection of the liver. Ten of these twenty-three cases were associated with cirrhosis of the liver, including two with extended right hepatic lobectomy, two with right hepatic lobectomy, three with left lateral segmentectomy, one with anterior segmentectomy, and two with partial resection.

Of eleven patients receiving palliative resection, four underwent ligation of the portal branch and one had ligation of the hepatic artery as a combined operation with hepatic resection.

There were two operative deaths from hepatic coma in patients with hepatocellular carcinoma in a cirrhotic liver; one died on the fourth day after right hepatic lobectomy and the other on the thirty-third day after extended right hepatic lobectomy with fulminating advanced cirrhosis in the hepatic remnant. However, one of the patients with cirrhosis survived seventeen years and five months after left lateral segmentectomy; death was caused by intracranial bleeding resulting from

a traffic accident. At autopsy no recurrent tumor was found. (Figures 2 and 3.) Two patients with cirrhosis and six without cirrhosis who underwent resection are still alive two years and five months, five months, seven years and four months, five years and five months, three years and four months, three years and two months, six months, and three months, respectively. The remaining twelve patients, five with cirrhosis, died of recurrent tumor one year, one year, two months, two months, one and a half months, two years and seven months, one year and four months, eight and a half months, seven months, five months, two months, and one and a half months after operation, respectively. (Tables III and IV.) Therefore, the mean survival of ten patients with radical resection was 42.5 months and that of eleven patients with palliative resection was 10.8 months; however, the mean survival in four patients with both palliative resection and ligation of the portal branch was 12.4 months, including long-term survival of three years and four months in one patient.

*Ligation of the Portal Branch or Hepatic Artery.* Of eight patients with palliative ligation of the portal branch alone, there were no operative

Figure 2. Resected lateral segment of a patient who survived seventeen years and five months.

Figure 3. Autopsy specimen of the cirrhotic liver (same patient as in Figure 2).

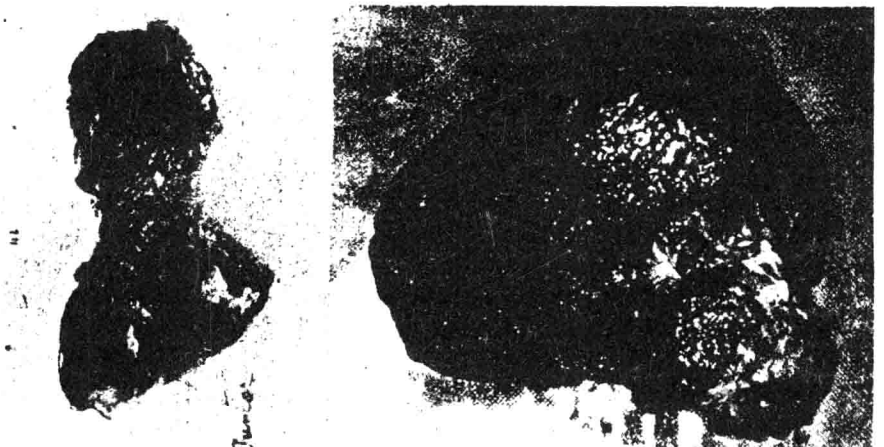


TABLE III Hepatic Resection for Carcinoma of the Cirrhotic Liver

Age (yr) and Sex	Type of Carcinoma	Grade of Edmondson	Type of Resection	Results
53, M	Hepatocellular	...	Right hepatic lobectomy	Dead, 4 days
37, M	Hepatocellular	III	Extended right lobectomy	Dead, 33 days
52, F	Hepatocellular	III	Extended right lobectomy	Dead, 2 mo
52, M	Hepatocellular	II	Right hepatic lobectomy	Alive, 5 mo
54, M	Hepatocellular	III	Lateral segmentectomy	Dead, 17 yr and 5 mo
50, F	Hepatocellular	...	Lateral segmentectomy*	Dead, 2 mo
40, M	Hepatocellular	II	Lateral segmentectomy with portal ligation*	Dead, 1 yr
68, F	Hepatocellular	II	Anterior segmentectomy	Alive, 2 yr and 5 mo
71, M	Hepatocellular	II	Partial resection*	Dead, 1 yr
54, M	Hepatocellular	II	Partial resection with artery ligation*	Dead, 1.5 mo

\* Palliative resection.

TABLE IV Hepatic Resection for Carcinoma of the Noncirrhotic Liver

Age (yr) and Sex	Type of Carcinoma	Grade of Edmondson	Type of Resection	Results
27, M	Hepatocellular	II	Extended right lobectomy	Dead, 1 yr and 4 mo
27, M	Hepatocellular	II	Extended right lobectomy	Dead, 7 mo
62, M	Hepatocellular	II	Extended right lobectomy	Alive, 7 yr and 4 mo
5 mo, F	Hepatoblastoma	...	Left hepatic lobectomy	Alive, 5 yr and 5 mo
8 mo, M	Hepatoblastoma	...	Right hepatic lobectomy	Alive, 6 mo
51, M	Hepatocellular	II	Middle hepatic lobectomy with portal ligation*	Alive, 3 yr and 4 mo
60, M	Hepatocellular	...	Lateral segmentectomy*	Dead, 5 mo
45, M	Hepatocellular	...	Lateral segmentectomy*	Dead, 2 mo
53, F	Hepatocellular	III	Lateral segmentectomy*	Alive, 3 mo
69, M	Mixed type	...	Lateral segmentectomy with portal ligation*	Dead, 2 yr and 7 mo
39, M	Hepatocellular	I	Partial resection	Alive, 3 yr and 2 mo
67, M	Hepatocellular	...	Partial resection*	Dead, 1.5 mo
65, M	Cholangiocellular	...	Partial resection with portal ligation*	Dead, 8.5 mo

\* Palliative resection.

deaths. The mean survival was 7.2 months in all eight patients, 4.2 months in those with cirrhosis, 8.1 months in those without cirrhosis, 4.7 months in those with hepatocellular carcinoma, and twelve months in those with cholangiocellular carcinoma. This demonstrates that ligation of the portal branch in patients with carcinoma of the liver is more effective in noncirrhotic patients and in those with cholangiocellular carcinoma with a long-term survival of one year and four months.

Of seven patients with palliative ligation of the hepatic artery alone, three who had jaundice before the operation died within one week. The mean survival in the remaining four patients was 3.2 months, showing that this procedure has less of an effect in patients with advanced cancer of the liver.

**Exploratory Laparotomy Alone.** Of thirty-three patients with exploratory laparotomy alone, four-

teen died within one month. The operative mortality was 42 per cent and the mean survival in the remaining patients was 3.7 months, including long-term survival of one year and three months in one patient receiving arterial infusion of an anti-cancer agent (mitomycin C).

**Postoperative Changes in Blood Chemistry.** Patients with cirrhosis showed hypoalbuminemia and hyperbilirubinemia for a long time after hepatic lobectomy, but those without cirrhosis showed little change in liver function unless there were postoperative complications. (Figures 4 and 5.) However, one of the cirrhotic patients survived seventeen years and five months after left lateral segmentectomy without remarkable changes in liver function. Conversely, ligation of the portal branch caused elevation of the serum transaminase in the early postoperative period, especially in patients with elevated preoperative levels, but no signifi-



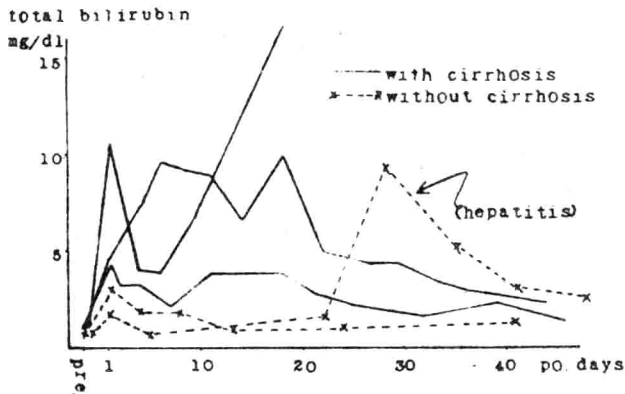


Figure 4. Changes in serum bilirubin after hepatic lobectomy in patients with cirrhosis.

cant differences were observed between cirrhotic and noncirrhotic patients. (Figure 6.) In our experience, ligation of the hepatic artery was contraindicated in patients with jaundice, because three patients died of hepatic insufficiency within one week after operation.

#### Comments

Because of the recent advances in diagnostic technic and surgical treatment for primary cancer of the liver which have led to an increase in the number of patients who become candidates for resection, an increase in the number of patients with long-term survival has been reported. Foster [2] reviewed 296 adult patients who underwent major hepatic resection for primary cancer of the liver and showed that of 135 patients followed up for five years or until death, 19 (14 per cent) were still alive at five years. From a review of all reports of successful surgical treatment up to 1970, Curutchet et al [7] collected seventy-seven cases of primary cancer of the liver in which the patient was still living three years or more after resection. Furthermore, survival of ten years or more after resection for primary cancer of the liver have been reported sporadically; these include one twelve year survival reported by Brunschwig [8], fourteen year survivals by Lawrence et al [9] and Taylor et al [10], twenty-one year survival by Ochsner, Meyers, and Ochsner [3], ten year survival by Kappel and Miller [11], ten and thirteen year survival by Brasfield, Bowden, and McPeak [12], and fourteen year survival by McBride and Wallace [6]. Therefore, if the operation is carefully chosen, significant palliation and some cures may be expected after hepatic resection for primary carcinoma of the liver.

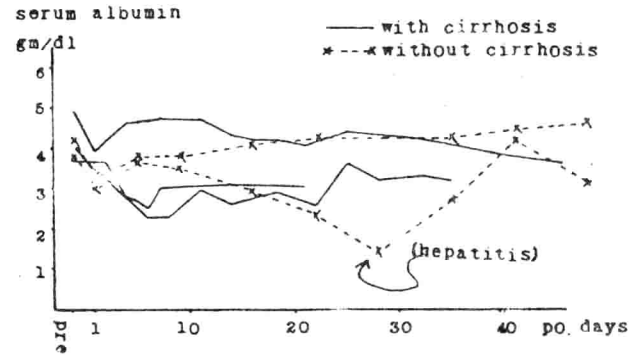


Figure 5. Changes in serum albumin after hepatic lobectomy in patients with cirrhosis.

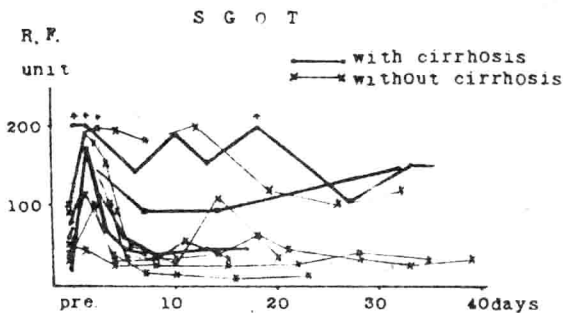


Figure 6. Changes in serum glutamic oxalacetic transaminase after ligation of the portal branch.

Most long-term survivors previously reported, however, were patients with cancer but without cirrhosis. The presence of cirrhosis seems generally to be a contraindication to major hepatic resection because the possibility of postoperative liver failure is increased and because patients with cirrhosis die of recurrent cancer at a much more rapid rate, as shown in the series of Wang and Li [13] in which 97 per cent of 130 patients in China had cirrhosis, with a 50 per cent mortality from recurrence within six months.

In our series, of ten patients with cirrhosis who underwent hepatic resection, two died from hepatic coma within two months, two had a delayed recovery of biochemical changes in blood and abnormal liver function for one month or more after hepatic lobectomy, and the remaining six patients survived segmental resection or operations of lesser magnitude without remarkable changes in liver function; one of these six was well for seventeen years and five months after left lateral segmentectomy until he was killed in a traffic accident. Therefore, the presence of cirrhosis is not a contraindication to hepatic resection unless cirrhosis is too severe and resection too extensive.

The patient with primary cancer of the liver who is unsuitable for surgical therapy is certainly incurable even with currently available means of treatment, and life expectancy is quite short, with a high mortality for surgical exploration, as shown in this series and in others.

Although favorable results with ligation of the hepatic artery in advanced cancer of the liver have been reported, our results were disappointing, with little palliation being achieved.

Four patients with nonresectable carcinoma of both lobes of the liver were treated by partial resection of the left lobe and ligation of the right branch of the portal vein. The other eight patients underwent ligation of the portal branch alone, because of the excellent results achieved in one patient with metastatic cancer in both lobes of the liver from cecal carcinoma, who had resection two years before and who is still alive with regression of tumor in the right lobe six years after left lateral segmentectomy and ligation of the right branch of the portal vein, as reported by Honjo and Suzuki [14]. The mean survival time of patients with both hepatic resection and ligation of the portal branch was 12.4 months; this includes a long-term survival of three years and four months for hepatocellular carcinoma. The mean survival time with ligation alone was 7.2 months and includes a long-term survival of one year and four months. These figures are superior to that of 3.7 months for exploratory laparotomy alone.

## Summary

Seventy-six patients with histologically proved primary cancer of the liver, including fifty-seven with hepatocellular carcinoma, fifteen with cholangiocellular carcinoma, and four with a mixed type, were admitted and treated at the First Surgical Clinic, Kyoto University Medical School during the twenty-two year period from 1951 to 1973. The symptoms, physical signs, and laboratory findings in these patients were reviewed. Of seventy-one patients with surgical exploration, twenty-three (32 per cent) underwent hepatic resection, eight had ligation of the portal branch, seven had ligation of the hepatic artery, and thirty-three had exploratory laparotomy alone. The final diagnosis in the remaining five patients

was established by autopsy or percutaneous needle biopsy. Twenty-eight of fifty-seven patients with hepatocellular carcinoma (49 per cent) also clearly had cirrhosis of the liver.

Of ten patients with cirrhosis who underwent hepatic resection, two died from hepatic coma within two months, two showed a delayed recovery of liver function after hepatic lobectomy, but the remaining six patients survived with no remarkable changes after segmental resection or procedures of lesser magnitude and one of them was well for seventeen years and five months after left lateral segmentectomy until he was killed in a traffic accident. Operative mortality in all patients who underwent hepatic resection was 9 per cent, and the one year, three year, and five year survival rates were 43, 22, and 13 per cent, respectively. For patients with nonresectable cancer, ligation of one of the main portal branches supplying the main tumor showed some improvement in their prognosis.

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# Management of Primary Liver Cell Carcinoma

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Primary liver cell carcinoma is very common in Malaysia, constituting about 4 per cent of all malignant lesions reported at the Institute of Medical Research, Kuala Lumpur, Malaysia [1]. Although the population of Malaysia is multiracial with 50 per cent Malays, 38 per cent Chinese, 10 per cent Indians, and the remaining 2 per cent indigenous, the Chinese have a very high incidence (68 per cent) of primary liver cell carcinoma. The causative factor is unknown, although 85.4 per cent of these patients also have cirrhosis of the liver. The daily intake of aflatoxins has been shown to be related to cancer of the liver in Thailand [2] and Kenya [3]. Available evidence does not eliminate the possibility that mycotoxins are also involved in the causes of primary liver cell carcinoma in Malaysia. Research on this aspect is currently being conducted in the Second Surgical Division of the General Hospital, Kuala Lumpur.

Moreover, Australian hepatitis-B antigen has been found in 31.7 per cent of our patients of all races with liver cell carcinoma, although the incidence in routine blood donors is about 8 per cent. This is a significant finding, but there is insufficient evidence to assess its role in this disease. Further research on the cause of primary liver cell carcinoma is being carried out in various parts of Africa and Asia including Malaysia. In our study, 40 per cent of the patients with cirrhosis of the liver were alcoholics and 20 per cent were severely malnourished.

## Clinical Data

Between January 1964 and July 1974, 352 patients with primary liver cell carcinoma were treated. These patients were referred from various parts of Malaysia. The ratio of males to females was 4:1. Their ages ranged from one to eighty-six years, the vast majority of the patients being between forty-five and sixty years. Forty-two patients were admitted with an acute abdomen after rupture of the hepatoma. Fifteen of these patients died before any effective treatment could be carried out. Thirty-eight patients were admitted with bleeding esophageal or fundic varices associated with cirrhosis of the liver, and fifty-two patients were admitted with end stage liver failure.

*Diagnosis.* Apart from the history and physical findings, the diagnostic aids used included hepatic scanning with indium 113 M using blood pool studies, celiac and splenic macroaggregat studies with iodine 131-tagged albumin, peritoneoscopy, angiography, and specific enzyme investigations.

Among the specific serologic tests, measurement of serum alpha-fetoproteins in conjunction with proline hydroxylase has allowed preoperative detection in 94.6 per cent of our patients with primary liver cell carcinoma. Contrary to other reported series [4] we have had no false-positive results in the 126 patients who underwent this test. We have also found that after complete resection of a hepatic tumor, the serum alpha-fetoprotein level becomes negative; however, it remains positive if the tumor is incompletely removed. Furthermore, follow-up studies have shown that a return to positive of the alpha-fetoprotein level signifies recurrence of the tumor. Based on this experience, we believe that these two serologic tests will eventually not only prove to be a good screening test, but also prove to be effective in evaluating the extent of the tumor.

All these investigations have allowed preoperative diagnosis of the nature, location, and extent of hepatic tu-

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**TABLE I** Types of Hepatic Resection Performed

Operation	Hepatoma	Operative Mortality
Left lobectomy	...	...
Left hemihepatectomy	4	...
Extended left hemihepatectomy	2	...
Right lobectomy	2	...
Right hemihepatectomy	7	1
Extended right hemihepatectomy	9	2
Right hemihepatectomy and left lobectomy	2	1
Total	26	4 (15.3 per cent)

mors [5], thus eliminating the need for exploratory laparotomy. These investigations have also established a more rational approach to the management of primary liver cell carcinoma.

### Treatment and Results

**No Treatment.** One hundred thirty-nine patients had no form of treatment. Thirty-four patients left the hospital against medical advice before any treatment could be begun. Thirty-seven of the thirty-eight patients admitted with coexisting cirrhosis and bleeding varices died of hemorrhage. The remaining sixty-seven patients were admitted with end stage disease, fifteen of whom had ruptured hepatoma. Despite resuscitation with blood, plasma, or other intravenous fluids, all died within two weeks of admission.

**Curative Resection.** Although complete resection of the involved lobe is the ideal form of treatment, because of the extensive involvement of both lobes of the liver and the multicentric characteristics of the tumor, the indications for resection in our patients with primary liver cell carcinoma are very limited. This finding is in keeping with those of other series [6,7]. Severe impairment of liver function with marked jaundice and significant ascites in addition to associated cirrhosis pre-

cluded any form of curative surgery [8]. Fewer than 7 per cent of the 352 hepatomas were resectable. Lin [9], however, reported a rate of exploration of 75.2 per cent and of resectability, 34.7 per cent. The presence of infiltration or thrombosis of the portal vein and inferior vena cava as shown by angiographic studies was a further contraindication to operation. Tables I and II show the extent of resection, survival, and mortality rate of the patients who underwent resection.

**Palliative Treatment.** Since the remaining 93 per cent of the 352 hepatomas were nonresectable, various forms of palliative treatment were attempted because the average period of survival of untreated patients was between two and four months from the time the patient was first seen.

After treatment, these patients were assessed as follows: (1) by objective measurement of changes that occurred on physical examination of tumor size, liver scanning, needle biopsy of the liver, angiography, and serial determinations of liver function; (2) by subjective evidence of improvement, including an increase in weight with a return of appetite, relief of abdominal pain, and a sense of well-being; (3) by autopsy study, which indicated that most of the tumor that responded to treatment had decreased in size or showed necrotic changes, although microscopic evidence of viable tumor tissue was still present.

**Regional chemotherapy:** Twenty-five patients had regional chemotherapeutic infusions of methotrexate or 5-fluorouracil via the hepatic or the right epiploic artery using the standard dosage [10]. Serious complications developed, including leakage, displacement of the catheter, and hemorrhage, in addition to the severe side-effects of the drugs, especially bone marrow depression. Most of these patients died within one to three months. This form of treatment has since been abandoned. Similar poor results have been reported in Asian patients [7,11,12], although Watkins [13] and Sullivan [14] and their co-workers have reported reasonably good results in their American series.

**Complete hepatic dearterialization:** Complete hepatic dearterialization, including ligation of all the collateral and accessory arterial supplies from the diaphragm, falciform ligament, abdominal wall, and adjacent organs, was performed in sixty patients in the three years from 1970 to 1972. This procedure is based on the principle that because a liver tumor derives its blood supply almost exclusively from the hepatic artery and its collaterals, necrosis of tumor tissue occurs after dearterialization [15]. On the basis of previous experience [16],

**TABLE II** Results of Resection

Result	Number of Patients
Postoperative death	4
Lost to follow-up study	1
Died within 1 year	6
Died within 2 to 3 years	4
Died within 3 to 4 years	2
Alive 2 to 3 years	4
Alive 5 years	5
Total	26