

## 6.3 Hepatic Resections for Metastatic Tumors

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The most common malignant neoplasm of the liver by far is metastatic tumor. Edmonson and Peters (1982) reported that among 7299 autopsies of extrahepatic primary malignancies, 38% of them had metastases to the liver, and they found that the five most common primary malignancies which had spread to the liver were bronchogenic, colonic, pancreatic, mammary and gastric cancer.

Although hepatic metastasis is a common event in the course of various malignant neoplasms, hepatic resection is uncommon. By the time the hepatic metastases are found, malignant tumors have usually already spread to extrahepatic sites. As an example, only 5–10% of patients who developed hepatic metastasis from colorectal cancer are candidates for hepatic resection, which comprises the largest number of patients for this operation (Wagner et al. 1984, Wood et al. 1976). As a rule, once hepatic metastasis is established, the disease is far advanced and the prognosis is extremely poor.

Over the years the authors have treated 118 patients with hepatic metastases of various malignant neoplasms by hepatic resection. The experience is summarized in this chapter.

### Case Materials and Methods

Over the last 20 years, a total of 400 patients have been treated by subtotal hepatic resection at our institution. 108 of these patients received surgery at the University of Colorado Health Sciences Center before 1981, and since 1981 the remaining 292 patients were operated upon at the University Health Center of Pittsburgh. 181 patients had histologically benign hepatic lesions and the remaining 219 patients had histologically malignant hepatic neoplasms. Of the 219 hepatic malignancies, 101 were primary hepatic malignancies and 118 were metastatic tumors (Table 6.3.1).

The most common metastatic tumor treated by hepatic resection was colorectal cancer (86 patients), followed by adrenal cancer and renal cancer (5 patients each) and by carcinoid tumor, breast cancer and leiomyosarcoma (4 patients

**Table 6.3.2 Histology of 118 secondary hepatic malignancies**

	No. of patients
Colorectal cancer	86
Adrenal cancer	5
Renal cancer	5
Carcinoid tumor	4
Breast cancer	4
Leiomyosarcoma of GI tract	4
Ovarian cancer	2
Melanoma	2
Glycagonoma (pancreas)	1
Squamous cell cancer of cervix	1
Medullary carcinoma of thyroid	1
Spindle cell sarcoma of intestine	1
Endometrial sarcoma of uterus	1
Ewing's sarcoma	1
Total	118

each). The origins of all metastatic hepatic malignancies are listed in Table 6.3.2.

The survival rates were calculated as of November 15, 1987 by the Kaplan–Meier method. Statistical comparisons were made by the Breslow and Mantel–Cox methods. The difference was considered as significant when the *p* value was less than 0.05.

Our operative techniques have been described in detail elsewhere (Starzl et al. 1975, 1980, 1982). The extent of hepatic resections was classified into the following six types: right and left trisegmentectomy, right and left lobectomy, left lateral segmentectomy, and non-anatomical local excision or wedge resection. Right trisegmentectomy is the removal of the entire right lobe plus the medial segment of the left lobe. Extended right lobectomy, which removes a part of the medial segment with the right lobe, was classified as right lobectomy in this report. Left trisegmentectomy is the removal of the entire left lobe plus the anterior segment of the right lobe. Extended left lobectomy was classified as left lobectomy. The extent of resection by various techniques is depicted in Figure 6.3.1.

## Results

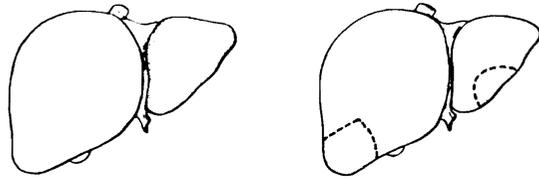
### Operative Mortality

All deaths within a month of hepatic resection were counted as operative deaths. There was, however, no operative death for metastatic liver tumors after 40 right trisegmentectomies, 5 left trisegmentectomies, 38 right lobectomies, 16 left lobectomies,

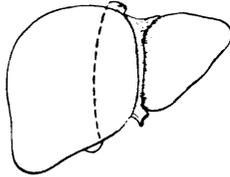
**Table 6.3.1 Indications of 400 hepatic resections**

Primary hepatic malignancy	101 patients
Secondary hepatic malignancy	118 patients
Histologically benign hepatic lesion	181 patients

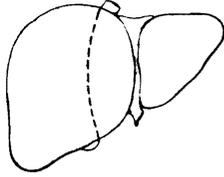
LATERAL SEGMENTECTOMY NON-ANATOMICAL RESECTION



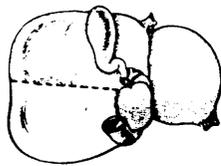
LEFT LOBECTOMY



RIGHT LOBECTOMY



LT. TRISEGMENTECTOMY



RT. TRISEGMENTECTOMY

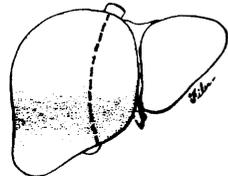


Fig. 6.3.1 Six kinds of hepatic resection

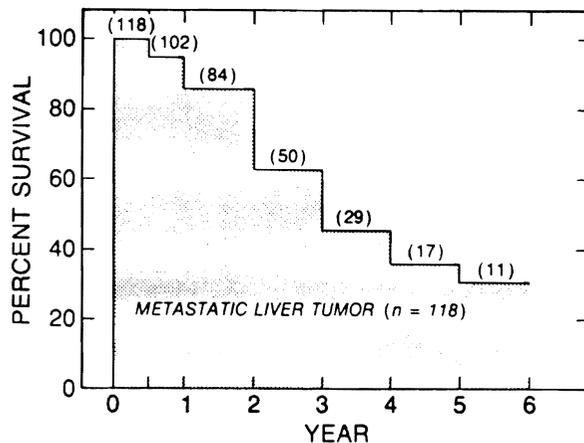


Fig. 6.3.2 Actuarial survival rates of 118 patients with various hepatic metastases after hepatic resection

12 left lateral segmentectomies and 7 non-anatomical, wedge resections. The operative mortality was zero percent after 118 liver resections.

Survival Rates

The overall survival rates of 118 patients with metastatic liver tumors were 86% at 1 year, 63% at 2 years, 46% at 3 years, 36% at 4 years and 31% at 5 years after hepatic resection (Figure 6.3.2). The

survival rates of patients with hepatic metastases from colorectal cancer were significantly higher than those of patients with metastases from malignancies other than colorectal cancer (*p* less than 0.05), as shown in Figure 6.3.3. 1-5 year survival rates of the former were 90%, 70%, 50%, 38% and 38%, respectively, and those of the latter were 73%, 42%, 33%, 28% and 16%, respectively.

Causes of Death

A total of 56 deaths were confirmed as of November 15, 1987. All but two patients died with recurrence of malignant tumors. One of the two patients died suddenly at home in the second postoperative month, and another patient died from liver failure in the third month. The majority of the recurrences were intra-abdominal, inside and outside the remaining liver, followed by lung, bone and brain metastases.

Five-Year Survivors

Among the 36 patients who had had hepatic resection more than 5 years ago, 11 patients lived more than 5 years (actual 5-year survival rate of 31%). 9 of the 11 patients had had hepatic resection for metastatic colorectal cancer, one patient having metastasis from neuroblastoma of the right adrenal gland and another patient having metastatic carcinoid tumor of the ileum. 3 of the 5-year survivors had had right trisegmentectomy, 3 had had right lobectomy, and 4 had had left lateral segmentectomy.

Discussion

None of the 118 patients with hepatic metastases died within a month after hepatic resection, but 8 of the 101 patients with primary hepatic malignancy and 4 of the 101 patients with histologically benign hepatic lesions dies within a month of the operation (Table 6.3.3). 5 of the 8 deaths among patients with primary hepatic malignancy occurred in the patients with cirrhosis. 2 of the 4 deaths among patients with histologically benign lesions occurred in hepatic trauma, one in fungal abscess, and another in misdiagnosed hepatoma in the cirrhotic liver. 8 of the 12 operative deaths were after trisegmentectomies, 3 were after right lobectomy and one after a wedge resection. The operative mortality rate of 3% (12 out of 400 patients) in our series and those of others (Fortner et al. 1981, Lin et al. 1987, Thompson et al. 1983, Tsuzuki et al. 1984) clearly indicates that hepatic resection can now be performed quite safely if the liver is not cirrhotic. The lower operative mortality among patients with metastatic tumors in our series and those of others (Adson et al. 1987, August et al. 1985, Fortner et al.

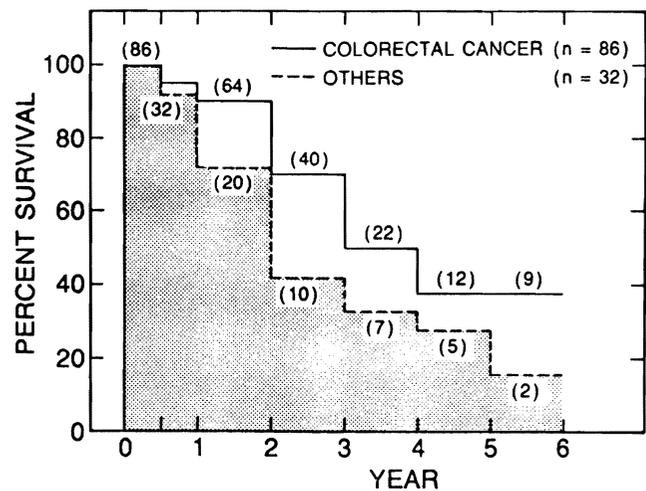


Fig. 6.3.3 Actuarial survival rates of 86 patients with hepatic metastases from colorectal cancer were significantly better than those of 32 patients with metastases from other than colorectal cancer after hepatic resection. Solid line: colorectal cancer; broken line: others

Table 6.3.3 Operative mortality (deaths within a month)

	Right trisegmentectomy	Left trisegmentectomy	Right Lobectomy	Left Lobectomy	Left lateral Segmentectomy	Local Excision	Total
Primary malignancy	4 of 47	2 of 8	1 of 16	0 of 17	0 of 3	1 of 10	8 of 101
Secondary malignancy	0 of 40	0 of 5	0 of 38	0 of 16	0 of 12	0 of 7	0 of 118
Benign Lesion	2 of 32	0 of 2	2 of 55	0 of 14	0 of 8	0 of 70	4 of 181
<b>Total</b>	<b>6 of 119</b>	<b>2 of 15</b>	<b>3 of 109</b>	<b>0 of 47</b>	<b>0 of 23</b>	<b>1 of 87</b>	<b>12 of 400</b>

1984, Nordlinger et al. 1987) may reflect the fact that the remaining part of the liver is usually normal in secondary hepatic malignancy.

The survival rates after hepatic resection for metastatic colorectal cancer in this report (90% at 1 year, 50% at 3 years, and 38% at 5 years) are slightly better than those obtained by others (Starzl et al. 1975, 1980, 1982, Thompson et al. 1983), but the differences are probably not statistically significant. In our first report (Iwatsuki et al. 1983) the 5-year actuarial survival rate was 57%, and in the second report (Iwatsuki et al. 1986) it was 46%. In this report, the 5-year actuarial survival rate has decreased further to 38%, and the 5-year actual survival rate was 31%. This decline in the survival rate is mainly due to the method of survival calculation (the method of Kaplan-Meier), but is also due to the fact that more advanced lesions were resected by trisegmentectomies during the last 5 years. The prognosis for metastatic lesions requiring trisegmentectomies was much worse than that of lesions which required lobectomies and lesser resections (Iwatsuki et al. 1986).

Median survival rates of patients who had had unresected solitary and multiple unilobar lesions

were 21 and 15 months, respectively, according to the report from the Mayo Clinic (Edmondson and Peters 1982). In our experience, the median survival rate for unilobar lesions, the lesions which were removed by lobectomy or lesser resection, was more than 48 months, while that for bilobar lesions, the lesions which required trisegmentectomies, was more than 24 months (Wagner et al. 1984). This improved survival rate by hepatic resection clearly justifies our efforts whenever possible to remove all hepatic metastases from colorectal cancer.

Isolated hepatic metastases from malignant tumors other than colorectal cancer are rare, and the experience in hepatic resection for these non-colorectal metastases is quite limited. Our personal group of 32 such patients is the largest in the literature to our knowledge. A larger collection can only be found in the multi-institutional review by Foster (1978). Although it may not be meaningful to consider all metastases from various primary malignancies as a group, the survival rates after hepatic resection of metastases from non-colorectal cancer were significantly worse than those of colorectal cancer, as shown in Figure 6.3.3. The median survival rate of this group was 20 months.

However, 7 patients survived more than 3 years after hepatic resection; one patient with neuroblastoma of the adrenal gland and one patient with carcinoid tumor lived more than 7 years, one patient with leiomyosarcoma of the rectum, one patient with medullary carcinoma of the thyroid and endometrial sarcoma of the uterus lived more than 4 years, and one patient with leiomyosarcoma of the stomach and one patient with adenocarcinoma of the ovary lived more than 3 years.

In Foster's collective review (1978), 9 (13%) of the 69 patients died postoperatively, but 19 patients lived more than 2 years, 8 of whom lived more than 5 years. Half of these long-term survivors had Wilms' tumor. The median survival rate for Wilms' tumor was 24 months, but that of other malignancies, such as melanoma, leiomyosarcoma, and cancers of the pancreas, stomach, uterus, ovary, kidney and breast, was less than 12 months. Based on these data, Foster concluded, 10 years ago, that hepatic resection of metastases from non-colorectal cancer should be discouraged. We have been in disagreement with his conclusion. In our experience **there was no operative mortality after hepatic resection of metastatic tumors**, and three-quarters of these patients were expected to live more than one year. It is unfortunate that the physical and psychological palliation achieved by this aggressive but safe operative approach cannot be expressed numerically. We will continue in our efforts to remove these otherwise untreatable malignant lesions surgically until a safer and more effective therapy can be established.

It is quite discouraging, though, to realize that nearly all of the deaths after successful removal of hepatic metastasis were caused directly or indirectly by recurrence of the primary malignancy. The recurrence most frequently occurred during the first couple of years after hepatic resection, but also recurred even after 5 years. There was usually enough time for adjuvant therapy. As major hepatic resection can now be performed with a minimum of risk, safer and more effective adjuvant chemotherapy and immunotherapy must be developed for further improvement in survival rates.

### Acknowledgement

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