

Pulmonary Resection for Metastases from Colorectal Cancer

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Introduction: The lung is the most common extraabdominal site for metastases from colorectal cancer. Patients with untreated metastatic disease have a median survival of less than 10 months and a 5-year survival of less than 5%. The purpose of this study was to evaluate long-term survival in patients who underwent pulmonary resection for metastases from colorectal cancer.

Methods: Between January 1990 and January 2005, 23 patients underwent 29 operations for resection of lung metastases.

Results: Median age was 68 years (range: 46–80 years). Median follow-up was 30 months (range: 12–149 months). The 2- and 5-year overall survival rates were 64 and 26%, respectively. Of the 23 patients, 16 patients had a solitary lesion, and seven patients had multiple lesions. The 5-year survival rates were 23 and 33%, respectively (not significant). The median disease-free interval (DFI)—the interval between colon resection and the appearance of lung metastases—was 43 months (1–168). Ten patients had DFIs <36 months, and 13 patients had DFIs >36 months. The 3-year survival rates were 20 and 38%, respectively (not significant). Recurrence of lung metastases was diagnosed in seven patients; three patients underwent second resections. They are alive today, with a median follow-up of 18 months. Patients who did not undergo second resections had a median survival of 12 months.

Conclusions: Pulmonary resection for metastases from colorectal cancer does produce longer survival, even in patients with multiple lesions and recurrent metastases.

Key Words: Lung, Resection, Metastases, Colorectal, Cancer.

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Colorectal cancer is the second-most commonly diagnosed malignancy in men and women in the Netherlands.

One of the most important predictors of survival in patients with colorectal cancer is lymph node status. In most countries, patients with curatively resected colorectal cancer without nodal tumor involvement do not receive adjuvant chemotherapy because studies have failed to demonstrate a beneficial effect.

Nevertheless, more than 30% of these patients will develop locoregional recurrence or distant metastases.¹ The lung is the most common extraabdominal site of metastases in patients affected by cancer of the colon. Patients with untreated metastatic disease have a median survival of less than 10 months and a 5-year survival of less than 5%.²

Conventional treatment of stage IV colorectal carcinoma in most patients is palliative. For a long time, fluoracil-based chemotherapy has been considered the standard treatment, but it seldom has produced long-term survival. Because no effective chemotherapy regimen has been identified for pulmonary metastases of colorectal origin, surgery is the only potentially curative treatment.

Divis³ performed the first resection of a pulmonary metastasis in 1927. Several retrospective studies since then have shown that patients with pulmonary metastases benefit from resection.

The published 5-year survival rates after pulmonary metastasectomy of colorectal origin range from 21 to 62%.^{4–7}

The purpose of this study was to evaluate postoperative mortality, morbidity, and long-term survival in patients who underwent pulmonary metastasectomy for metastases of colorectal cancer.

PATIENTS AND METHODS

Between January 1990 and January 2005, 23 patients underwent 29 operations for resection of lung metastases from colorectal cancer in the Jeroen Bosch Hospital, the Netherlands. Data were collected from the patient records, both electronic and paper. Information was collected on the clinical characteristics of the patients, operative reports, and the reports of the pathologist. The following patient characteristics and data were analyzed: age, gender, carcinoembryonic antigen (CEA) levels, primary site of the tumor, number and type of pulmonary resections, completeness of resection, second resection, disease-free interval (DFI), infiltration of pulmonary or mediastinal lymph nodes, postoperative morbidity, mortality, and long-term survival.

Selection criteria for resection were as follows: (1) controlled primary tumor, (2) controlled or controllable extrathoracic lesion, and (3) computed tomography scan demonstrating that radical resection could be performed regardless of the number of lesions. Tumors in both lungs were not considered a contraindication. Principally, wedge resection

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TABLE 1. Survival Rates of 23 Patients Who Underwent Pulmonary Resection

Survival Rates	2 yr (%)	5 yr (%)
Overall survival	64	25
Cancer-free disease survival	52	18
Disease-free interval <36 months	79	0
Disease-free interval >36 months	78	38
Solitary lesions	70	23
Multiple lesions	50	33

TABLE 2. Number of Lesions and Type of Surgery

	No. of Patients
Type of lesions	
Solitary lesions	16
Multiple lesions	7
Recurrence	7
Type of surgery	
Wedge resection	15
Lobectomy	11
Bilobectomy	2
Pneumonectomy	1

was the procedure of choice; if this was not possible, a lobectomy or a pneumonectomy was performed.

Survival was estimated by the method of Kaplan and Meier, using the date of the pulmonary resection as the starting point. The influence of variables on survival was analyzed using the log-rank test for discrete variables. Follow-up was done routinely every 3 months, using CEA levels in blood samples and computed tomography of the thorax/abdomen on indication. Table 1 and 2.

RESULTS

The median age of patients at time of diagnosis of lung metastases was 68 years (range: 46–80 years). Twelve patients were men and 11 patients were women.

In 12 patients, the primary origin of the tumor was the colon, and in 11 patients, the primary origin was the rectum. There were 15 wedge resections, 11 lobectomies, two bilobectomies, and one pneumonectomy.

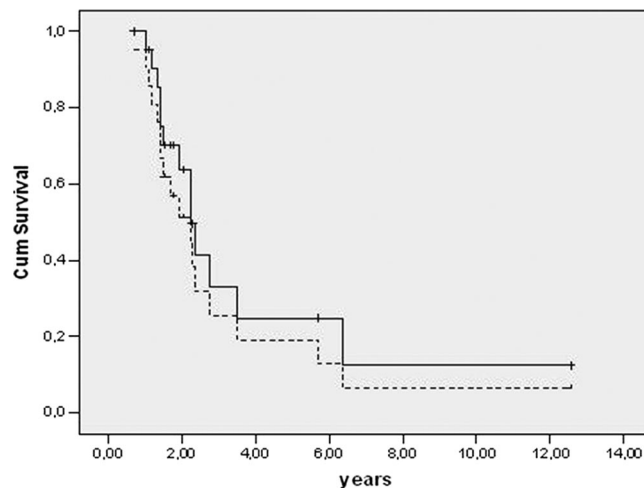
There were 20 patients with unilateral disease and three patients with bilateral disease. The median number of metastases per patient was one.

At operation, no mediastinal lymph node dissection was done routinely.

Only “lymph node picking” was done if there were pathological lymph nodes during surgery. This procedure was performed in 11 of the 23 patients. The mean number of lymph nodes was two. There were no patients with metastases in these lymph nodes, and all operations were radical.

None of the operated patients died after surgery.

Five patients developed postoperative complications (17.9%). One patient had a postoperative hemorrhage after a wedge resection, necessitating rethoracotomy; one patient

**FIGURE 1.** Kaplan-Meier survival curve for 23 patients who underwent pulmonary resection for metastases from colorectal cancer. Black solid line, overall survival; black dotted line, cancer-free disease survival.

had a wound infection after a wedge resection (sternotomy); one patient developed pneumonia after a lobectomy; one patient developed an abscess of the superficial thorax wound after a wedge resection; and one patient developed an empyema after a bilobectomy.

Pulmonary Metastasectomy and Survival

Median follow-up for the whole group was 30 months (range: 12–149 months). The 2-, 5-, and 10-year overall survival rates were 64, 25, and 12%, respectively. The 2-, 5-, and 10-year cancer-free disease survival rates were 52, 18, and 5%, respectively (Figure 1).

Combined Liver/Lung versus Lung Metastases and Survival

One of 23 patients underwent a hemihepatectomy for liver metastases before lung surgery. Originally, this patient underwent a right hemicolectomy for a Dukes B colon carcinoma. After 2 years, the patient developed liver metastases.

One year after the hemihepatectomy, he developed metastases of the right lung, for which he underwent a bilobectomy. Two years after the bilobectomy, the patient developed recurrent lung metastases and bone metastases. He died 6 years after the bilobectomy.

DFI and Survival

DFI was defined as the interval between colon resection and the appearance of lung metastases. DFIs ranged from 1 to 168 months, and the median DFI was 43 months. Ten patients had a median DFI <36 months, and 13 patients had DFIs >36 months. The 3-year survival rates were 20 and 38%, respectively ($p = 0.32$) (Figure 2).

Solitary versus Multiple Lung Metastases and Survival

Of the 23 patients, 16 patients had a solitary lesion and seven patients had multiple lesions. The 2-year overall sur-

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