

Surgery for Metastatic Lung Tumors

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Surgical outcome for metastatic lung tumor was evaluated on the basis of a result of clinical experience.

Some factors related to the survival were analyzed in terms of tumor size, number, location, the disease-free interval, tumor doubling time and so on.

It is certain that the prognosis well correlated with the tumor-size of more than 3cm, number of the tumor, tumor doubling time of less than 55 days, and positive node metastasis.

Surgery should be limited to a resection of a minimum healthy lung resection to enhance postoperative quality of life and to prepare for repeated operation for late recurrence.

Introduction

With advances in thoracic surgery, surgical treatment has been applied for metastatic lung tumor. Effort has been made to increase life expectancy by aggressive treatment.

It is well known that the blood from all parts of the whole body inflow the lung which is adequate for implantation and proliferation of malignant cells, acting as a final filter for malignant cells mingling in blood flow.

Needless to say, the lung is second filter for malignant tumors of the digestive organ although the liver is the first one.

Recently pathogenesis of carcinoma is now clarified and the effects of anticancer agents have become potent in accordance with the development of satisfactory anticancer drugs.

In this study we clinically evaluate the validity of surgical treatment for metastatic lung tumors.

Patients

During the time from January 1966 to June 1990, 51 metastatic lung cancers and 15 metastatic lung sarcomas underwent a surgical resection at the First Department of Surgery, Nagasaki University School of Medicine (Table 1).

Table 1.

Carcinoma		Sarcoma	
lung cancer	15	bone	8
breast cancer	7	skeletal muscle	4
chorion epithelioma malig.	5	synovia	2
rectal cancer	4	cartilage	1
others			
head and neck	5		
urogenital	8		
digestive	6		
skin	1		
	51		15

The numbers of resected foci were 44 (66.7%) in solitary and 24 (33.3%) in multiple, 11 in double, five in triple and nine in over triple, respectively.

The patients' ages ranged from 14 to 79 years old with the average of 49.9 years old. These were widely distributed and the ratio of men to women was 29 to 39, showing predominance in women.

The operative procedures used comprised of partial and segment resection in 46 and lobectomy and bilobectomy in 29.

The time interval from the time of treatment for primary focus to that of the appearance of metastasis ranged from three months to six years and six months, indicating that most metastases occurred within one to two years. On the other hand, comparison in the disease-free interval was made between cancer and sarcoma.

It was defined that metastasis from sarcoma occurred at least one year earlier than that from cancer. Nodal involvement in the hilar region was positive in nine out of 25 patients who underwent node dissection. Furthermore, four patients with positive node metastasis were involved in the mediastinal nodes.

The primary foci with hilar node metastasis were gastric cancer and, breast cancer in each two and uterine cancer in one respectively.

The sizes of lung metastasis showed 1.0 to 3.0cm in diameter in most of the patients. The size of over 5.1cm in diameter was seen in 14.7% of all the patients. There was no significant difference between cancer and sarcoma.

The survival was excellent in patients with the operative procedure of lobectomy rather than that of segmentectomy. However, the other factors related to the such as the extent of disease and the kinds of primary diseases should be taken into consideration (Fig. 1).

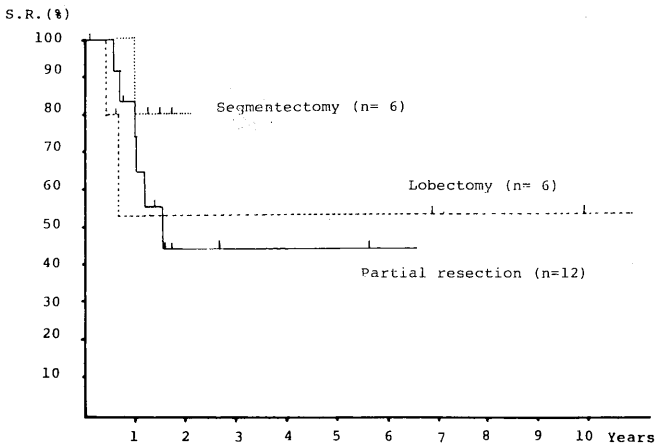


Fig. 1. Survival rates according to operative procedures to multiple lung metastasis cases

Concerning the number of metastatic lung tumors, there was no close relationship in the survival between number of two to four multiple and solitary tumors. In contrast, there was a significant difference between number of less than four and more than five (Fig. 2). The longer the time interval to be detected, the better the surgical outcome and the longer the survival would be expected (Fig. 3). The disease-free time duration of more than five years could be expected to be a satisfactory result.

There was no significant difference in the survival between the disease-free intervals of two and three years. Furthermore, the survival rate was much more favorable patients with the diameter of less than 3cm than in those with the diameter of more than 3cm (Fig. 4).

In analysis of patients who survive more than five years, it was characteristic of solitary lesion with the tumor diameter of less than 3cm. On the other hand, in patients with poor prognosis of surviving less than one year, there was no close correlation with any other factors such as the original cancer, disease-free interval, numbers of metastasis and operative procedure. In 21 patients with repeated resections for metastasis, the ages ranged from 16 to 79 (averaged 50.5 years old). A half of resected cases were solitary and the other half were multiple. Most of multiple metastases were two or three in number. The sizes of metastases ranged from 1.0 to 4.0cm in diameter. Most of repeated resections were involved by sarcoma. In comparison with the survival between patients who could calculated the doubling time, the survival in patients with the doubling time of less than 50 days was apparently shortened.

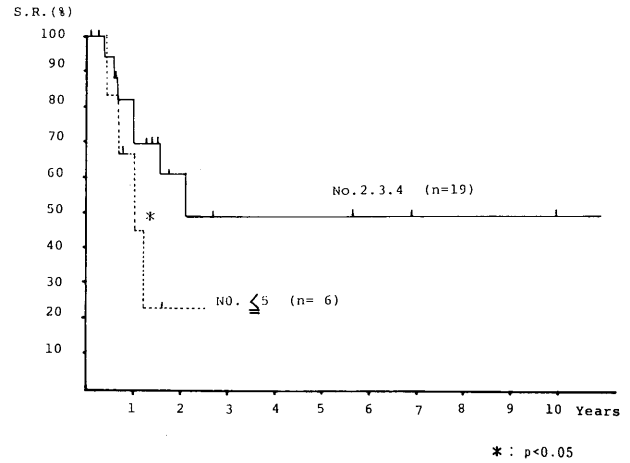


Fig. 2. Survival rates according to number of lung metastasis in multiple lung metastasis cases

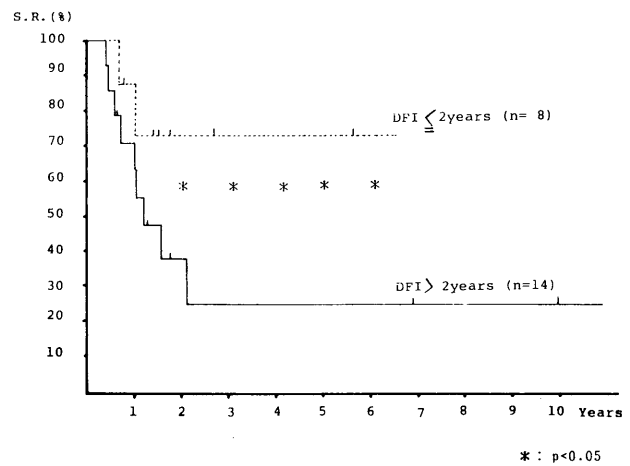


Fig. 3. Survival rates according to disease free interval in multiple lung metastasis cases

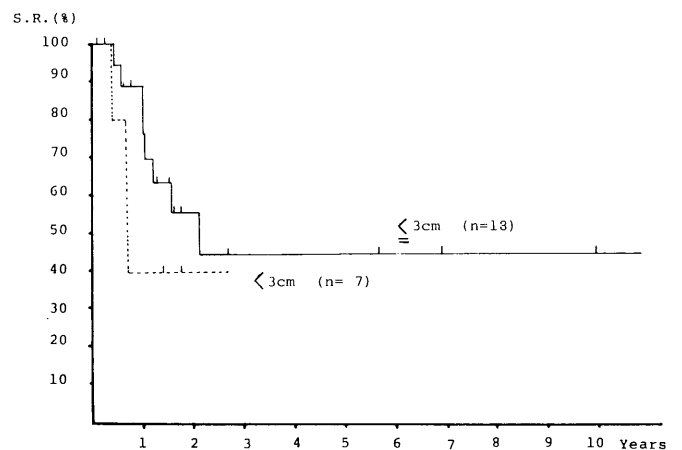


Fig. 4. Survival rates according to size of metastatic lung tumors in multiple lung metastasis cases

Partial resection was very commonly used for repeated resections. The time duration to be second operation ranged from two months to 121 months. In general, reappearance of metastasis in sarcomas was relatively earlier than that in cancers. The shorter the time duration until of metastasis, the worse the survival outcome would be expected. Most of them were multiple and adjuvant therapy was of no effect to reduce the appearance of disease in almost cases.

Inhibition of increasing tumor growth is only mandatory for surgical treatment. Therefore, we extended the surgical indication for metastasis, even as large as 10cm in diameter. However the surgical outcome was not satisfactory except for a temporary relief of symptoms, indicating a short survival time from one to 19 months. There was no significant difference in the survival between cancers and sarcomas. When patients with sarcoma survive more than year, it is anticipated that the prognosis is satisfactory. Meanwhile, it is suggested that patients with cancer should be a long follow-up over five years.

The tumor size of 3 to 5cm in size well correlated with the survival. Whether the disease-free interval is less than three year or more closely correlated with a two-year survival rate. On the other hand, a five-year survival showed no any relationship to the prolongation of disease-free interval.

Postoperative pulmonary function was evaluated at nine to 12 months after surgery in terms of %VC and FVC_{1.0}. As indicated in Fig. 5 and 6, the second surgery was not contributory to reduced pulmonary function. In contrast, it

was showed that third operation and more apparently provoked pulmonary hypofunction.

It is necessary for surgeons to bear in mind that surgically unnecessary loss of healthy pulmonary tissue should be limited to the minimum which is imperative for ensuring oncologic radicality. In view of postoperative pulmonary function test, reduction of %VC was much more significant than that of %FVC_{1.0}. It is assumed that reduced pulmonary compliance due to thoracotomy is attributable to a reduction of %VC in the postoperative course.

Discussion

The criteria of surgical indication for metastatic lung cancer by Thomford¹⁾ are now broarded in its clinical use and it is aiming at increasing life expectancy in combination with chemotherapy.

The problems confronting surgeons are how to indicate the surgical treatment for metastasis. To date there is no great matter of concern about solitary or multiple, one side or both side, the size of metastatic tumor and the disease-free interval.

To date, surgery is indicated when patients are well general condition tolerable to sugery and primary disease are now completely controlled without any sign of metastasis^{2,4)}. In addition, physicians take the response to chemotherapy into consideration when nodal involvement exists in the mediastinum.

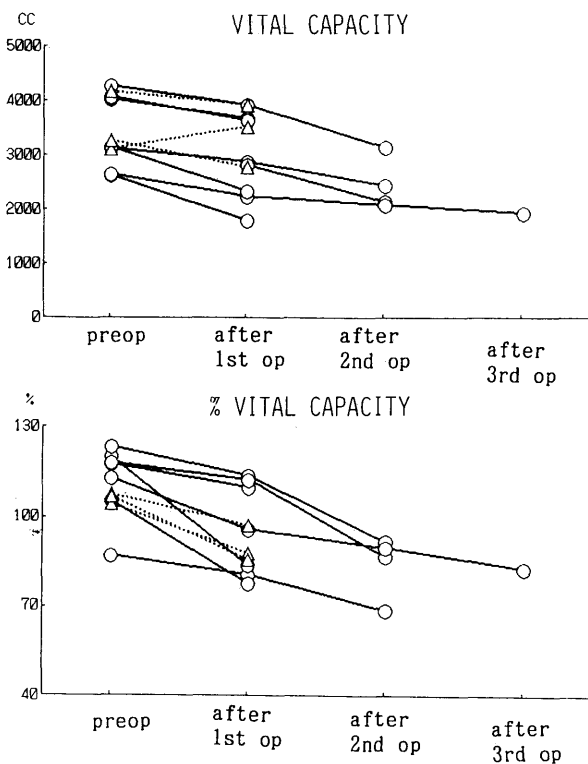


Fig. 5. Changes in VC d %VC postoperatively

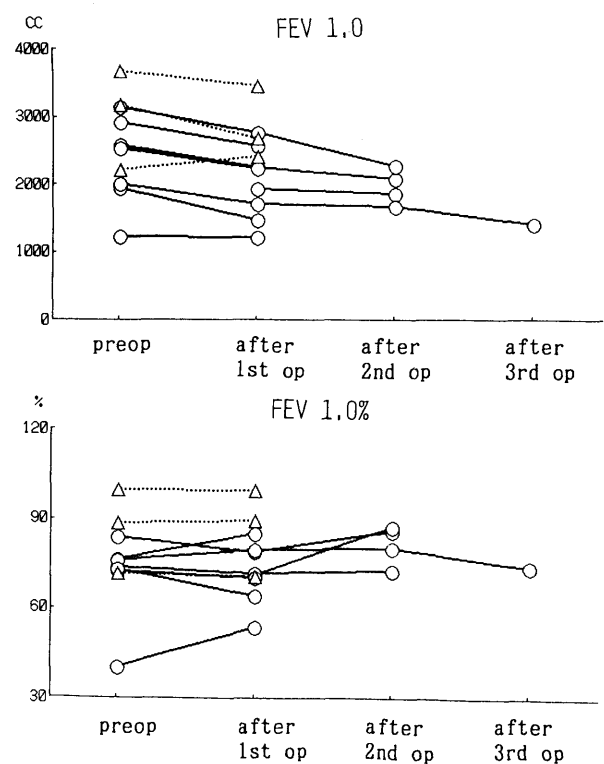


Fig. 6. Changes in EEV_{1.0} d FEV_{1.0} postoperatively

In patients with carcinoma, a long term follow-up is necessary because recurrence occurs following a lapse of two or five years. From a result of this study, the favorable prognosis could be expected in patients with the tumor size of less than 3cm, unilateral metastasis and the disease free-interval of more than five years. On the contrary, it is accepted that there was no close correlation with the tumor size, number, the site and the disease-free interval. However, the doubling time of less than 55 days closely correlated with the survival. On the other hand, the doubling time of more than 55 days did not provide a significant mean of the survival. Kittle⁹⁾ reported that potent anticancer drugs have been developed and these made the patient with carcinoma possible to prolong life expectancy.

The prognosis of patients with lung carcinoma relates to remained lung volume and a presence of micrometastasis irrespective of the tumor size of less than 3cm or more solitary or multiple. Since the effects of anticancer drugs are not obvious at present, surgery is mandatory for metastasis from lung cancer, if possible.

In patients with metastasis of colon cancer, surgery offers a good result if neglected liver metastasis. Goya⁶⁾ clarified that the survival of metastasis from colon cancer is affected by the size and number of metastasis and in cases with the tumor size of less than 3cm, the prognosis is fair.

The surgical outcome of metastasis from osteogenic sarcoma has become improved with advent of improved anticancer drugs of CDDP, MTS, ADM.

Roth⁷⁾ pointed out that the prognosis for metastasis following surgery closely correlated with the doubling time and number of the tumor. From the standpoint of primary tumors, a poor prognosis was shown by carcinomas of the thyroid, and the breast, urinary bladder.

In patients with metastasis from thyroid cancer, the favorable prognosis was shown except for undifferentiated carcinoma. On the other hand, some of metastasis from breast cancer showed a great response to chemo-endocrine therapy with advent of antiestrogen drugs. In carcinoma of the urinary bladder, it is difficult to manage locally and to control intraperitoneally.

To date, surgery for pulmonary metastatic tumor is showing a great change in the application irregardless bilateral and multiple tumors.

If micrometastasis around the main tumor is present,

postoperative chemotherapy plays a great role in inhibiting tumor growth following a limited operation. It is a significant meaning of reduction surgery. Furthermore, there are many chances to repeat a resection for metastasis. Furthermore, surgeons should pay attention to preservation of healthy lung tissue as much as possible in order to enhance postoperative quality of life. Recently new operative technique has been developed as Laser assisted parenchyma-sparing pulmonary resection and midsternotomy has been widely used as one-stage resection for bilateral metastasis.

It is a great matter of concern about surgical indication for patients with a presence of nodeal involvement.

In fact, it is difficult to accurately estimate a presence of node metastasis by CT and US. In patients with a presence of positive node metastasis, the prognosis was very poor. It is emphasized that the operative procedure of node dissection is essential for patients with lymphatic metastasis from metastatic foci. The validity of node dissection should be evaluated by further accumulated analysis.

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