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Surgical Treatment for Pulmonary Metastases

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This study is based on 29 patients undergoing resection for pulmonary metastases from 1960 to 1981 in our clinics.

Factors concerning their prognosis are discussed in this study.

- 1) Prognosis following surgery is associated with the origin of the primary disease, the sizes and numbers of pulmonary metastases, and the disease-free period.
- 2) Pulmonary metastases arising from original tumors with slow growth rate, such as thyroid cancer, breast cancer, and some of osteogenic sarcomas, are favorable candidates for surgical treatment.
- 3) Operative methods of choice are not essential in anticipating better results. Complete removal of the tumor is required. We assume that improved chemotherapy may be contributory to a gain in a longer survival.

INTRODUCTION

Surgical indication for metastatic lung tumors has become recognized and accepted in improving survival.

A gain of long-term survivor following pulmonary resection appeared encouraging surgeons. It, however, is clear that metastasis in the lung means the tumor is spreading elsewhere in the body and so satisfactory results are not necessarily ensured by surgical treatment for pulmonary metastases. In this study, influential factors on prognosis following lung resection for the treatments of pulmonary metastases are evaluated on the basis of the results of our clinical experience with 29 cases treated surgically.

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MATERIAL AND METHOD

A total of 29 cases were eligible for evaluation in this study, 22 were in cancer origin and the remaining 7 were in sarcoma origin (Table 1). Primary cancer lesions consisted of chorionepithelioma in 5, breast cancer in 4, lung cancer in 4, gastric cancer in 3, thyroid cancer, renal cancer, rectal cancer, hepatic cancer, cancer of the cervix and cancer of salivary gland in 1 respectively.

The primary sarcoma lesions were osteogenic in 4, and synovial sarcoma, reticulumcell sarcoma and malignant histiocytoma in 1 respectively. The surgical specimens were histologically examined and the histologic types of metastatic lesions in the lung were proved to be similar to those of the original lesions.

The tumor doubling times were retrospectively assessed with measurement of the sizes of tumorous shadows in serial chest XP films.

RESULTS

According to age distribution, patients with sarcoma were younger than those with cancer.

Their ages ranged from 10 to 68 (Table 2).

The locations of metastatic tumors in the lungs were the right upper lobe in 6, right middle lobe in 3, right lower lobe in 11, left upper lobe in 4 and left lower lobe in 5.

Solitary metastatic tumors in the lungs were seen in 22 (75.9%) and multiples in 7 (24.1%). The numbers of tumors in the preoperative evaluation based on findings on chest XP films, were not in concordance with those at surgery in two cases. The additional metastatic lesions were detected.

The sizes of the metastatic tumors in the lungs ranged from less than 1 cm to 6.5 cm as shown in Table 3. The sizes of cancer at operation were not different from those of sarcoma. Time intervals from the first operation to the appearance of metastatic tumor shadow on chest XP films varied from the same time with the first operation to 6.8 years (Table 4). It, however, was relatively short for sarcoma. Most of them were within 1 year. The surgical procedures of choice were wedge resection in 9, segmentectomy in

Table 1 Patients and primary disease

Primary tumor	No of	Primary tumor	No of
Cancer	cases	Sarcoma	cases
chorion-epithelioma	5	osteogenic sarcoma	4
breast cancer	4	synovial sarcoma	1
lung cancer	4	reticulum cell sarcoma	1
gastric cancer	3	malignant histiocytoma	1
thyroid cancer	1		
renal cancer	1		
rectal cancer	1		
hepatic cancer	1		
cervix cancer	1		
salivary gland cancer	1		
total	22		7

Table 2 Age and sex of patients

Age (years)	sex	
	Male	Femal
~20	1(1)	1(1)
~30	2(2)	0
~40	1(1)	2
~50	2	3
~60	3	10(2)
60	2	2

() sarcoma

Table 3 Tumor size

Size of metastatic tumor (cm)	No of cases (%)
1.0	3 (10.3)
2.0	10(4) (34.5)
3.0	3 (10.3)
4.0	4(2) (13.8)
5.0	3 (10.3)
5.1	6(1) (20.7)

() sarcoma

Table 4 The time interval from the first operation to detected pulmonary metastases

Disease-free interval (years)	No of cases
the same with the time of primary tumor detected	2
whthin 1	8(5)
2	4
3	8(1)
5	2
over 5	5(1)

() sarcoma

Table 5 The operative methods employed in patients with pulmonary metastases

Operative method	No of cases
wedge resection	9
segmentectomy	3
lobectomy	18
bi-lobectomy	2

3, lobectomy in 18 and bilobectomy in 2 (Table 5).

Lobectomy was more preferable in our institute.

Lymph node dissection was performed in 14. Nine of the 14 cases had no lymph node involvement, and 2 had involved lymph nodes in the hilum of the lung and 3 in the mediastinum.

Prognosis was analyzed according to original diseases, the elapsed time between the first and second operations and the sizes of metastatic tumors. Survivors of more than 5 years were among patients with breast cancer, thyroid cancer and cancer of the salivary gland. In comparison, the survival rate of sarcoma except for some of the osteogenic sarcomas did not exceed over 2 years.

As for the period of time between the first and second surgery (Fig. 1), the survival period following the second surgery is well correlated with the prolonged disease-free time interval. The longer the tumor doubling time, the better the assurance of survival. (Fig. 2), but a long doubling time of over 40 days did not permit a satisfactory prognosis.

The tumor sizes of pulmonary metastases were inversely proportional to survival time (Fig. 3). The tumor size of less than 2cm in diameter had led to a considerably fair prognosis.

The operative procedure with regard to lymph node dissection was not helpful to

obtain a better survival.

The degrees of involved lymph nodes were closely associated with survival following surgery (Fig. 4).

The overall survival rates in surgical treatments of pulmonary metastases were encouraging as shown in Fig. 5.

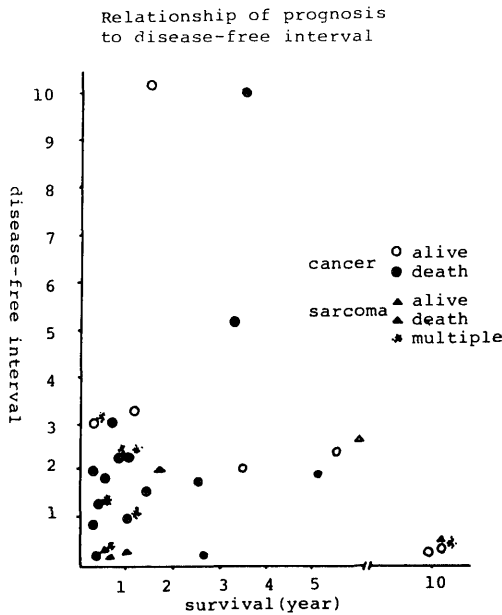


Fig 1 Relationship between prognosis and disease-free interval

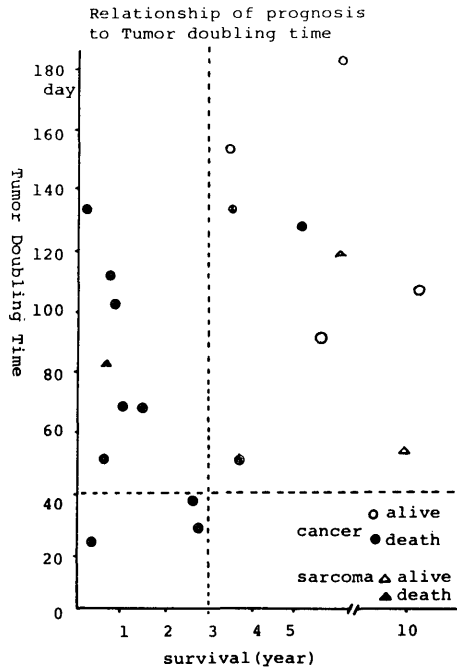


Fig 2 Relationship between prognosis and tumor doubling time

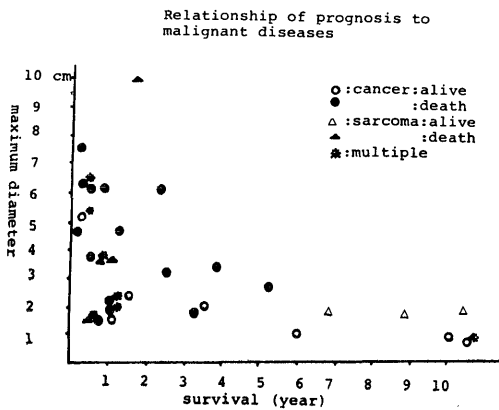


Fig 3 Relationship between prognosis and tumor size

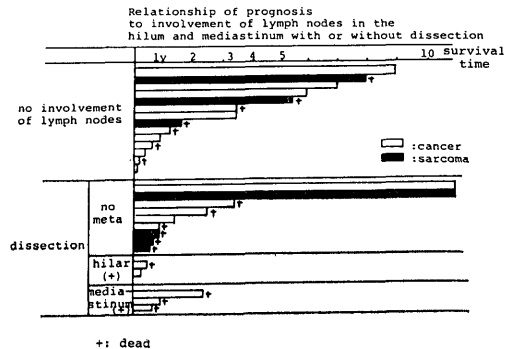


Fig 4 Relationship between prognosis and lymph node involvement or lymph node dissection

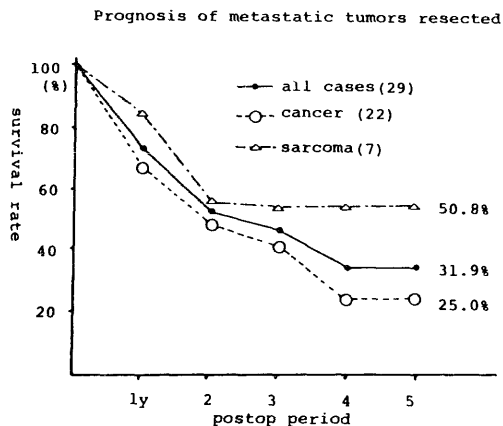


Fig 5 Survival rate in the surgical treatment of pulmonary metastases

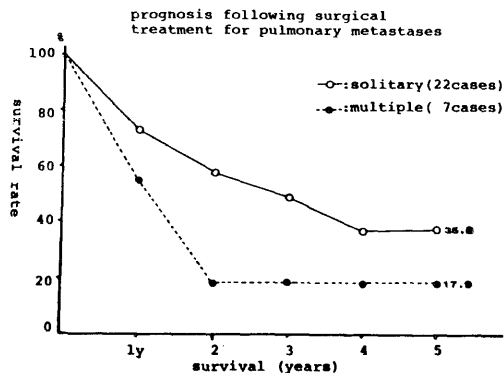


Fig 6 The difference of survival rate in solitary and multiple lesions

The survival times in solitary lesions were excellent as compared with those in multiple lesions (Fig. 6). There were no significant differences in prognoses between after performing lobectomy and segmentectomy. All patients received various anticancer drugs in the postoperative period. Long-term survivors of more than 3 years following the second surgery were given a protracted anticancer drug regimen of more than 2 years after the second operation.

DISCUSSION

Surgery in the treatment of pulmonary metastases is now acceptable in patients with solitary lesion limited to the lung.¹⁾⁻³⁾

Surgical treatment of pulmonary metastases was indicated as reported by Thomford.⁴⁾

The primary site must be controlled; There must be no extrapulmonary metastasis; The patient must be a good condition for operative risk and the metastatic site must be solitary, not multiple.

In this study, the prognosis following surgery for the treatment of pulmonary metastases are closely related to a longer tumor-doubling time, a long disease-free time interval and a smaller-sized lesion or tumor. From the perspective of kinds of original diseases types, there were gratifying results in breast cancer, thyroid cancer, cancer of the salivary gland, osteogenic sarcoma and synovial sarcoma, all which responded well to and were well controlled by chemotherapy. With the development of improved chemotherapy, it appear possible to suppress postoperative recurrences to some extent as well as to minimize the appearance of pulmonary metastases.

Surgical results have improved, particularly in breast cancer, colon cancer and osteogenic sarcoma.

The schedule of treatment for pulmonary metastases should be established using improved chemotherapy in combination with irradiation and immunotherapy. If metastatic tumor, however, increases in size, surgery is mandatory.

It is obvious that surgical treatment is effective in those whose lung tumor sizes are smaller, disease-free time intervals are longer, the original lesions are well controlled and metastatic tumors are solitary.

Whether the prognosis following surgery is fair or poor remains in doubt. Post-operative anticancer regimens are necessary for preventing occurrence or recurrence and providing prolongation of survival time.⁵⁾⁶⁾

As a result of this study, we conclude that surgical operative methods including lymph node dissection are not responsible for prolonged survival. Limited resection as elective surgical procedure in the treatment of pulmonary metastases is beneficial in preserving sufficient functioning pulmonary tissue. We believe that the benefit from the limited resection performed seems to outweigh the risk of remaining unresected micro-metastatic foci.

The result of lobectomy performed in the surgical treatment of metastatic tumor is not superior to that of limited resection although available data must be accumulated.

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