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Treatment of Pulmonary Metastatic Disease

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Pulmonary metastatic disease was formerly thought to be evidence of hopeless progression of malignant disease, but resection of the metastatic lesion, in carefully selected cases, has changed this hopeless prognosis for many patients. Divis[6] performed the first successful resection of pulmonary metastasis in 1926 in Germany. Four years later, Torek[14] was the first in the United States to successfully resect a pulmonary metastatic lesion, which, however, was considered preoperatively to be a primary tumor. Barney and Churchill[2] were the first in the United States to remove what was considered to be a metastatic pulmonary lesion. The patient, a 55-year-old woman, had a mass in the left pulmonary field. Nephrectomy was performed on April 18, 1932, for adenocarcinoma of the kidney. Despite roentgenotherapy, the pulmonary tumor continued to enlarge. On July 18, 1933, wedge resection of the left upper pulmonary lobe was performed, and the tumor proved to be metastatic. The patient died of coronary disease 23 years later.[16]

Thomford and associates[13] reported the largest series on record of patients with pulmonary metastasis treated surgically (221 operations on 205 patients). Richardson[11] collected 35 cases of pulmonary metastasis in children treated by excision.

White and Krivit[15] reported 2 cases of lengthy survival after resection of pulmonary metastasis. One was a 21-month-old baby with a Wilms's tumor treated by nephrectomy and irradiation. One year later two nodules developed in the left upper lobe of the lung, which were removed by wedge resection; the patient was well ten years later. The second was a 6-year-old child with a rhabdomyosarcoma in the right side of the neck, which was incompletely excised and treated with 3000 roentgens. Nine months later a

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nodule developed in the lingula and was removed by wedge resection; the child was well five years later.

Wilkins and associates[16] reported a series of 67 patients who had had 75 operations for removal of pulmonary metastasis. One patient had three separate thoracotomies, 4 had bilateral operations, and, in 2, second procedures were done on the same side.

In 1963, results in 25 cases of metastatic pulmonary lesions in which 28 operations were done at Ochsner Foundation Hospital were reported.[19] Since then 6 additional patients have been operated on.

Diagnosis

Usually the diagnosis is made by routine roentgenography of the chest. Symptoms have been reported in a small percentage of patients. A chronic cough is the most frequent; hemoptysis, thoracic pain, and fever have also been mentioned. In rare cases hypertrophic pulmonary osteoarthropathy[1, 7, 13] has been reported. Cytologic and bronchoscopic examinations are not as helpful in diagnosis as in primary tumors of the lung.

Surgical Indications

Removal of a metastatic pulmonary lesion is justified only if there is a possibility of cure. The patient should have no evidence of recurrent or metastatic disease other than the pulmonary lesion. The general condition of the patient should be evaluated. It is extremely important to explain to the patient and the family that the pulmonary lesion is probably not the only metastatic lesion even though no other metastatic sites can be detected. Clagett and Woolner[4] recommended examining the patient again three months after the pulmonary metastasis is discovered. They stated that except in patients with suppuration or massive hemorrhage postponing operation for three months did not appear to be detrimental, and it provided an opportunity for other metastatic lesions, not apparent on earlier examination, to develop to a point where they could be detected. We believe that such a delay could be harmful because, in view of the number of people who smoke, the pulmonary lesion could possibly be a primary tumor rather than a metastatic one.

Personal Experience

At the Ochsner Clinic 34 operations have been performed on 31 patients with pulmonary metastasis, 3 having had two operations. Of the 34 operations, there were 16 lobectomies, 6 pneumonectomies, 5 multiple resections (lobectomy, multiple segmental resection, or lobectomy and segmental resection), 4 segmental resections or wedge resections, and 3 composite resections, consisting of removal of the thoracic wall, bony thorax, and pulmonary tissue. There were no operative or hospital deaths. Eleven patients died within the first year. One patient was known to be alive at the end of three months but could not be followed thereafter.

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Table 1. *Durat*

Sarcoma	
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Fibrosarcoma	
Liposarcoma	
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Angiosarcoma	
II Osseous sarcoma	
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Carcinoma	
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Undifferentiated	
stomach	
Malignant melan	
Seminoma	
Embryonal adeno	
testes	
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D = dead. L = living

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The distribution of cases according to duration of survival and type of primary malignant disease is shown in Table 1. Testicular tumors had the best prognosis; osseous sarcomas had the poorest. All 3 patients with sarcoma of bone died within 3 years. Patients with soft part sarcomas fared poorly also, with only one patient surviving. This patient, who had an angiosarcoma of the thigh, is living ten years after pulmonary resection. The prognosis was better in patients with carcinoma than in those with sarcoma.

Prognosis

Thomford and associates[3] estimated the five-year survival rate after surgical treatment to be 30 per cent. This is comparable to the results of surgical treatment of many primary malignant tumors.

Although our series is small, it seems to indicate that the prognosis is influenced by the length of time that elapses before appearance of the pulmonary metastasis. Thus, the prognosis was most favorable in patients in whom the duration from primary resection to pulmonary resection was longest.

Table 1. *Duration of Survival in 31 Patients Treated by Pulmonary Resection for Metastatic Pulmonary Disease*

	NO. OF CASES	1 YR. OR LESS	1–3 YR.	3–5 YR.	>5 YR.	>10 YR.
Sarcoma						
I Soft tissue sarcoma	12					
Malignant mesenchymoma	9					
Cystosarcoma phylloides	2	1LR	1D			
Fibrosarcoma	2	1D	1D			
Liposarcoma	2	2D				
Rhabdomyosarcoma	1			1D		
Angiosarcoma	1	1D				
II Osseous sarcoma	1					
Osteogenic sarcoma	3					1L
Fibrosarcoma	2	1D	1D			
	1		1D			
Carcinoma						
Adenocarcinoma, colon and rectum	19					
Adenocarcinoma, breast	5	1L 1D 1LR	1D			
Undifferentiated carcinoma, stomach	4	1D		1D 1LR	1L	1L
Malignant melanoma	1		1D			
Seminoma	5	1L 1LR 2D		1D	1L	
Embryonal adenocarcinoma, testes	1					
Squamous-cell carcinoma, cervix	1				1L	
Squamous-cell carcinoma, tonsil	1	1D				
	1		1L			

D = dead L = living R = recurrence.

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Collins[5] was convinced that the prognosis is greatly altered by the interval before pulmonary metastasis becomes evident. He collected 180 cases of pulmonary metastases which were suitable for study of the rate of growth in the pulmonary neoplasm. The average time for the tumor to double in size was 116 days. The average duration of the pulmonary metastasis when first seen was 127 months, with a range from 61 to 225 months. Wilkins and associates[16] reported only a 10 per cent five-year survival rate in patients who had had pulmonary resection less than five years before resection of the primary tumor. The patients who had had pulmonary resection more than five years after resection of the primary tumor had a five-year survival rate of 40 per cent. Thomford and associates[13] reported a three-year survival rate of 22.6 per cent in those in whom the interval between resection and appearance of the metastatic lesion was less than one year, 42.6 per cent for an interval of one to four years, and 40.62 per cent when the interval was more than four years.

The longest survival on record is 23 years[16] in a patient with renal adenocarcinoma. Jensik and Van Hazel[8] reported extremely poor results with treatment of malignant renal lesions.

Kelly and Langston[9] reported better results in sarcomas than in carcinomas. This is contrary to our experience as well as that of others.[12, 13] Streider[12] reported a 41 per cent survival rate for carcinoma and only 33 per cent for sarcoma. Thomford and associates[13] reported a 32.5 per cent five-year survival for carcinoma as compared to a 23.1 per cent five-year survival for sarcoma. In the series of Wilkins and co-workers,[16] the best prognosis was in urinary lesions (13 per cent five-year survival), followed by uterine (12 per cent), endocrine (10 per cent), mammary (6 per cent), and gastrointestinal (4 per cent). Of 17 patients with melanoma and 27 with miscellaneous lesions, none survived five years. On the other hand, Chang and Niguidula[3] believed that there is no correlation between the length of survival and the type of tumor.

Conclusion

Resection of metastatic disease of the lung in selected cases results in little risk and the expected survival rate of 27 to 30 per cent represents total salvage. Resection should be performed only in patients in whom no other evidence of metastasis can be detected and there is a possibility of cure. The longer the interval between resection of the primary tumor and appearance of the pulmonary metastasis, the better the prognosis. The prognosis is also better in patients with carcinoma than in those with sarcoma.

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