

Surgery Versus Stereotactic Radiosurgery for Single Synchronous Brain Metastasis from Non-Small Cell Lung Cancer

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ABSTRACT

Objective: The aim of this study is to compare the effectiveness of surgery with stereotactic radiosurgery (SRS) for patients with a single synchronous brain metastasis from successfully treated non-small cell lung cancer.

Methods: Between 1995 and 2002, 53 patients underwent resection of both primary non-small cell lung cancer and the associated single brain metastasis. There were 33 men and 20 women with a mean age of 57 years (range, 32–85 years). At the time of diagnosis, 42 patients experienced lung cancer related symptoms, whereas 11 patients experienced brain metastases-related symptoms. 42 patients had received thoracic surgery first, and 11 patients had undergone neurosurgery or radiosurgery first. Pneumonectomy was performed in 9 out of 42 patients (21.4%), lobectomies in 30 (71.4%), and wedge resection in 3 (7.2%). 48 patients (90.5%) underwent complete lymphadenectomy. 35 patients underwent brain metastasectomy. 18 underwent SRS.

Results: There was no postoperative mortality and severe complications after either lung or brain surgery. Histology showed 34 adenocarcinomas, 16 squamous cell carcinomas, and 3 large cell lung cancers. 15 patients (28.3%) had no evidence of lymph node metastases (N_0), 20 patients (37.7%) had hilar metastases (N_1), and 18 patients (34%) had mediastinal metastases (N_2). The 1-, 2-, 3- and 5-year overall survival rates were 49%, 19%, 10%, and 5%, respectively. The corresponding data for neurosurgery group were 55%, 17%, 11%, and 6%, respectively. The median survival time was 13 months. For SRS group the corresponding data were 44.8%, 20.9%, 10.5%, and 2%, respectively. The median survival time was 14 months. The differences between the two groups were not significant ($P>0.05$). In lymph node negative patients (N_0), the overall 5-year survival rate was 10%, as compared with a 1% survival rate in patients with lymph node metastases (N_{1-2}). The difference was significant ($P<0.01$). For adenocarcinomas, the 5-year survival rate was 5%. The correspondent data for squamous cell lung cancers was 3%. The difference was not significant ($P>0.05$).

Conclusion: Although the overall survival rate for patients who have brain metastases from NSCLC is poor, surgical resection or radiosurgery may be beneficial in a select group of patients with synchronous brain metastases and lung cancer without lymph node metastases.

Key words: Non-small cell lung cancer (NSCLC); Synchronous brain metastasis; Surgery; Stereotactic radiosurgery (SRS)

INTRODUCTION

Lung cancer is the leading cause of cancer mortality in both men and women in China. Every year more than 600,000 deaths from lung cancer occur in China. Brain metastases occur in

30% to 50% of patients with non-small cell lung cancer (NSCLC)^[1-3]. In most cases brain metastases are multiple, but they may be solitary in 27% to 50% of such cases^[4, 5]. Patients with brain metastases from NSCLC have a poor prognosis. Treatment modalities include corticosteroids, chemotherapy, radiotherapy, stereotactic radiosurgery (SRS), or neurosurgery^[6]. Combined neurosurgical resection and radiotherapy usually leads to rapid

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and lasting regression of symptoms and may prolong survival by decreasing neurologic morbidity and mortality^[7, 8].

According to previous study, 25% of patients with single brain metastasis would benefit from curative neurosurgery^[7]. The aim of this study was to compare the effectiveness of surgery with stereotactic radiosurgery for patients with a single synchronous brain metastasis from successfully treated non-small cell lung cancer.

PATIENTS AND METHODS

Patient Selection

A retrospective review was performed between 1995 and 2002 to evaluate the outcome for non-small cell lung cancer with a single synchronous brain metastasis. Patients with multiple brain metastases or with systemic metastases to any other organ were excluded. All hospital records were thoroughly reviewed in a retrospective manner. A total of 53 patients were identified who met the study criteria. These patients accounted for 4.5% of patients who underwent operations for lung cancer in the same period in our institute.

General Clinical Data of Patients

Patients included 33 men and 20 women. The mean age was 57 years (range, 32–85 years). The median Karnofsky performance status (KPS) score was 70 (range, 60–90). Patients had a complete workup before definitive treatment. The standard investigations included at least a chest roentgenogram, a chest CT scan, an upper abdominal ultrasonography or CT scan, a pulmonological examination, serum chemistries, and bone scintigraphy. The brain tumor was confirmed by brain computed tomography (CT) and/or magnetic resonance imaging (MRI).

Symptoms

At the time of diagnosis, 42 patients experienced lung cancer related symptoms (36 patients experienced coughs, 8 patients experienced chest pains, 6 patients exhibited pneumonia, and 3 patients experienced dyspnea), whereas 11 patients experienced brain metastases-related symptoms (6 experienced headaches, 4 experienced paresis, and 1 experienced convulsions), and in these patients

brain metastases were diagnosed first and lung cancer were detected by routine check.

Resection of Lung Cancer

Operations of lung cancer were performed in all patients. Forty-two patients had received thoracic surgery first, and 11 patients had undergone neurosurgery or SRS first. In neurosurgery group, the time between the two operations was <30 d for 15 patients, between 31 to 60 d for 13 patients, >61 d for 7 patients. The mean time between the two operation was 40 d. Pneumonectomy was performed in 9 out of 42 patients (21.4%). Indications for pneumonectomy were endobronchial invasion of the tumor to the main stem bronchus in 5 patients and direct invasion of the tumor to the surrounding bronchus or vessels in 4. Lobectomies were performed in 30 patients (71.4%), and wedge resection in 3 (7.2%). 48 patients (90.5%) underwent complete lymphadenectomy.

Patients with metastatic mediastinal lymph nodes (n=38) received adjuvant mediastinal radiotherapy and chemotherapy. The median dose of radiotherapy was 50 Gy (range, 25–60 Gy).

The Treatment of Single Brain Metastasis for All Patients

A total of 35 patients underwent brain metastasectomy (neurosurgery group). The mean interval between lung resection and metastasectomy was 2 m (range, 0.5–6 m). 18 underwent SRS (SRS group). The postoperative whole brain radiotherapy (WBRT) was performed on all patients either receiving neurosurgery or SRS.

Follow-up

Survival was measured from the date of the first treatment for malignancy. The follow-up was finished in 48 patients (91%). The mean follow-up was 14 m. The survival rate was assessed using the Kaplan–Meier method with a software of SPSS 11.

RESULTS

Postoperative Mortality and Complications

There was no postoperative mortality and