

SIMULTANEOUS THORACO-CRANIAL OPERATION FOR THE TREATMENT OF LUNG CANCER WITH BRAIN METASTASES

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We performed simultaneous one-stage thoraco-cranial surgery on ten cases of lung cancer with brain metastases during the period of 1990 to 1994. Surgical mortality was 0% with low morbidity. By the end of the follow-up in February 1995, 4 patients died, with a mean survival of 8.25 months; and 6 patients survived, with a mean survival of 16 months and the longest one being approximately 36 months. Our results showed that, if patient's general condition permits, simultaneous one-stage thoraco-cranial operation is feasible for the treatment of lung cancer involved the periphery with solitary intracranial metastasis. Postoperative adjuvant chemotherapy is indicated to achieve better results.

Key words: Lung cancer, Brain metastases, Surgery

Eighteen cases of lung cancer with brain metastases were admitted to the Affiliated Hospital of Nantong Medical College during the period of 1990 to 1994, among whom 10 cases were selected for the simultaneous one-stage thoraco-cranial surgery under the general anesthesia.

CLINICAL DATA

General Data

The 10 cases consisted of 8 males and 2 females, and aged 43 to 63 years old with average of 51.9 years.

Clinical Manifestations

The interval between appearance of initial symptoms to diagnosis ranged from 1 week to 3 months. Seven cases with headache, vomiting, fatigue, or seizure were initially evaluated in the neurosurgery clinic and were found intracranial tumors on the CT scan. And further evaluation revealed primary lung cancer in the 7 cases. The rest three cases were seen in thoracic surgery clinic for recurrent cough, hemoptysis, or chest pain. Imaging studies showed lung cancer, and consequently diagnosed with intracranial metastasis on CT scan after development of such symptoms as headache and vomiting.

Imaging Study

Chest X-ray and tomography or chest CT scan were performed in all 10 cases to locate the position of the lung cancer. The lung cancer showed as a mass lesion, usually with varied densities and irregular border, and some of the lesion were lobulated. The brain CT scan of the 10 cases showed a solitary, rounded, hyperdense or mixed-dense mass lesion, with the size varying from 2 to 4 cm. A hypodense edematous changes were found around the supratentorial tumor with remarkable mass effect, in contrast to the subtentorial lesion which usually showed dilatation of the ventricular system.

Location of primary Lung Cancer and Brain

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Metastases

Primary loci of lung cancer were in the left upper lung in 1 case, right upper lung in 2, right lower lung in 3, and left lower lung in 4. The brain metastases were located in the cerebellar hemisphere in 2 cases, and in the left cerebral hemisphere in 5 cases, and right cerebral hemisphere in 3, involving frontal, temporal or parietal lobes. None of the cerebral lesion involved the occipital lobes.

Size of primary Lung Cancer and TNM Staging

The size of the lung cancer ranged from 3.0 to 6.5 cm. Of the 10 cases, 4 involved parabraonchial lymph nodes, and 1 hilar lymph nodes. The 10 cases were classified into T2N0M1 in 5 cases, and T2N1M1 in 5 cases.

RESULTS

The Operations

The operations were performed under combined endotracheal and intravenous anesthesia. The surgical team was divided into neurosurgical and thoracosurgical groups. The two surgical groups operated simultaneously in 7 cases with lung cancer and brain metastases at the same site of the body. In the rest three cases with lung cancer and brain metastasis at the opposite sites of the body, thoracosurgical group performed first, followed by the neurosurgical group's operation. The surgical procedures included the lobectomy, resection of hilar lymph nodes, and the en bloc resection of intracranial tumor along the margin of surrounding edematous tissue, and removal of partial skull for external decompression.

Pathology

The resected lung cancer and brain tumor specimens were sent for the pathological studies. The lung lesion histologically matching brain mass in each case. The 10 cases consisted of 4 of adenocarcinoma, 3 of poorly-differentiated adenocarcinoma, 2 of papillary adenocarcinoma, and 1 large cell carcinoma.

Results

Postoperative pleural effusion occurred in 1 case, and worsening of hemiparesis in 2 case, which were successfully treated. All patients achieved the phase I wound healing. The average hospital stay was 15 days. The patients were followed up closely after discharge. The end-point of the follow-up was February 1995, by which 4 patients died, 1 of diffuse intracranial metastases 2 months after surgery, 1 of mediastinal metastases 5 months post surgery, 2 of recurrence of intracranial metastases 12 and 14 months after surgery, respectively. The rest 6 cases survived through the end point of follow-up, with a mean survival of 16 months, the longest approximately 36 months, and the shortest 8 months.

DISCUSSION

The prevalence of lung cancer with intracranial metastasis is high, ranging from 30% to 50%.¹ Among all histological types, adenocarcinoma is the most common with brain metastasis.² Nine out of 10 cases in this study were adenocarcinoma. Brain metastases can happen in all stages of lung cancer, most often occurs within 6 months after diagnosis of lung cancer. Some patients, however, may show the pulmonary and cranial symptoms simultaneously, while a small number of patients may show initial cranial symptoms.

Treatment of lung cancer with brain metastases is usually difficult. Surgery has been the treatment of choice. Shen, et al³ reported surgical treatment of 12 cases of lung cancer with brain metastases. Among their 12 cases, 9 cases were diagnosed having brain metastases during the hospitalization. The Shen's group performed two-stage surgical procedures, i.e., lung surgery followed by brain surgery, or vice versa. We performed lung and brain surgery simultaneously under the general anesthesia. There was no surgical mortality, and nor serious complications. The 4 cases died during the follow-up period, with a mean survival of 8.25 months. The rest 6 cases had a mean survival of 16 months, with the longest approximately 36 months. Ours study showed the advantage of one-stage simultaneous thoraco-cranial operations over two-stage procedures, which is indicated in the patients of whom general conditions permitted. The advantages are resection of lung and brain tumors with shorter surgery, and avoided the dilemma of later a second operation, and provided the prerequisites for other adjuvant therapies, which would have great

psychologic impact on the patients.

Success of the surgery was largely dependent upon proper selection of the patients. Firstly, patient's cardiac, respiratory, hepatic, and renal condition should be stable enough to tolerate the major trauma from the simultaneous operation involving two organ systems. Cachexia of cancer precludes the surgery. Secondly, the primary foci of lung cancer should be peripheral type. The efficacy of the surgery was poor for the lung cancer with obvious hilar lymph node involvement. One case in the study with hilar lymphadenopathy died 5 months postoperatively. The central type of lung cancer or those with massive pleural effusion precludes the surgery. Thirdly, the surgery is most suitable for the solitary brain tumor. The surgery may also be indicated for those with two separated foci of brain metastases, but not indicated for those with more than three brain tumor foci. And fourthly, the patients should have no metastatic foci involving other organ systems. Preoperative ultrasonography or CT scan was done in each case of the study to rule out the metastatic tumors in other organs.

Pre- and post-operative supportive therapy is important, since the one-stage simultaneous thoracocranial surgery is a major trauma. Prior to the surgery, our patients routinely received 200 to 600 c.c. of blood transfusion, and after the surgery, they also received high-calorie intravenous fluids, and in some, blood transfusion. We suggest that thoracosurgical and neurosurgical groups perform simultaneously to shorten duration of the procedure, if lung cancer and brain metastasis are at the same site of the body. For the patients whose lung and brain tumors are at the opposite sides of the body, the lung surgery should be

performed first, followed by the brain surgery. Lobectomy is feasible for the lung tumor, and can be added with eradication of local lymph node if tumor has involved lymph nodes. As for the brain tumor, we managed to perform complete en bloc resection of the tumor to minimize the possible risk of leaving residue or replanting of tumor cells. If the brain tumor involves the nondominant hemisphere, it may be wise to aspirate the edematous tissue surrounding the tumor to reduce the intracranial pressure. For that sake we also routinely performed decompression by resection of a portion of skull.

It was reported by many authors^{1,4} that postoperative adjuvant chemotherapy, radiotherapy, and immune therapy improved the efficacy of the surgery and prolonged the survival. The ten patients in this study all received intravenous chemotherapy; and two of the cases also received chemotherapy via an intraarterial catheterization.

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