

# Necessity of Preoperative Screening for Brain Metastasis in Non-small Cell Lung Cancer Patients without Lymph Node Metastasis

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**Background:** The exclusion of brain metastasis is important to determine the optimal treatment plan in patients with non-small cell lung cancer (NSCLC). However, a routine examination using magnetic resonance imaging (MRI) for the brain remains controversial in preoperative patients with resectable disease.

**Methods:** To assess the necessity of routine brain MRI for preoperative patients, a retrospective analysis for a consecutive series of 338 patients with NSCLC was performed. Among the 338 patients, 141 patients who were considered to have potentially resectable diseases through an examination of the chest plus an upper abdominal computed tomography scan and bone radioisotope scan with no neurological symptoms received MRI for examination of brain metastasis.

**Results:** The incidence of brain metastasis detected by MRI was 2.1% (three of 141) in all patients, 0% (zero of 80) in patients with N0 disease, 5.2% (one of 19) in N1, and 4.7% (two of 42) in N2 cases.

**Conclusion:** In patients with resectable NSCLC, a brain MRI is not considered to be useful due to the low incidence of asymptomatic brain metastasis. (*Ann Thorac Cardiovasc Surg* 2004; 10: 347-9)

**Key words:** non-small cell lung cancer, nodal metastasis, brain metastasis, magnetic resonance imaging

## Introduction

The initial staging of non-small cell lung cancer (NSCLC) is essential for determining the appropriate treatment for patients.<sup>1)</sup> However, in such patients without any manifestation of distant metastases in a physical examination including a detailed neurologic evaluation and complete blood chemistry study, it remains controversial as to whether or not a full examination should be routinely done. A number of authorities have recommended that an investigation of the most likely sites of metastatic dis-

ease such as the bone, brain, liver, and adrenal glands should be restricted to patients with symptoms or signs which suggest metastases.<sup>2-5)</sup> Others have, however, suggested that imaging of the adrenal glands, head, bones, and liver, or several combinations thereof should be included in a routine investigation of all patients with lung cancer before a thoracotomy because of the possible existence of silent metastases.<sup>6-12)</sup>

Regarding examinations for brain metastases, magnetic resonance imaging (MRI) is reported to have a greater sensitivity and specificity than computed tomography (CT) scans.<sup>13,14)</sup> However, we hypothesize that the occurrence of brain metastasis is rare in patients who are considered to have resectable disease. In this retrospective study, we investigated the necessity of performing brain MRI for patients who are considered to have resectable disease based on chest CT, abdominal CT and bone scans as well as a physical examination.

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## Patients and Methods

The medical records of all patients who underwent a clinical examination for the staging of NSCLC between April 1996 and December 1998 at National Kyushu Cancer Center, Fukuoka, Japan, were reviewed. The staging protocol during this period consisted of chest CT, radioisotope bone scanning, MRI or CT of the brain, and upper abdominal CT. Among a consecutive series of 338 patients with lung cancer, a total of 280 received brain MRI to evaluate their brain metastases, and the other 58 patients were evaluated by CT. Among the 280 patients, 139 patients were excluded from this study as unresectable cases because of an advanced intrathoracic stage such as T4 (a tumor with either malignant pleural effusion or malignant pericardial effusion, or one that invades either large vessels, the esophagus or vertebral body), cN3 disease, cM1 disease except for brain metastasis, and those considered to have some neurologic symptoms with brain metastasis.

The remaining 141 patients were all considered to have potentially resectable lung cancer, and were subjected to this analysis. The incidence of brain metastasis on MRI was reviewed. They consisted of 98 males and 43 females and their mean age was 63 years (range, 36 to 90 years). Seventy-six patients had T1-2N0, 2 had T3N0, 2 had T4N0, 16 had T1-2N1, 2 had T3N1, 1 had T4N1, 28 had T1-2N2, 12 had T3N2, 2 had T4N2, while 81 were adenocarcinomas (57.4%), 42 were squamous cell carcinomas (29.8%), 9 were small cell carcinomas (6.4%), and 4 were large cell carcinomas (2.8%). All patients had an ECOG performance status ranging from 0 to 2.

## Results

The proportion of each TN subset of this cohort is summarized in Table 1. Regarding T3 diseases, seven patients had mediastinal pleural invasion, three chest wall invasion, one pericardium invasion, one direct invasion of another lobe and four invasion of the main bronchus measuring less than 2 cm distal to the carina. All T4 cases had separate nodule (s) in the same lobe of the primary tumor. As for N factor, N0 cases comprised the most common subset (56.7%), followed by N2 (31.0%) and N1 (13.3%).

Three (2.1%) of 141 patients had asymptomatic brain metastasis, one patient in each of the T2N1, T2N2 and T3N2 subsets had asymptomatic brain metastasis and the respective rates were 6.7% (1/15), 5.6% (1/18) and 8.3%

**Table 1. The proportion of evaluated patients and patients with silent brain metastasis as classified according to the presence of T and N factor**

	T1	T2	T3	T4
N0	0/37 (0%)	0/39 (0%)	0/2 (0%)	0/2 (0%)
N1	0/1 (0%)	1/15 (6.7%)	0/2 (0%)	0/1 (0%)
N2	0/10 (0%)	1/18 (5.6%)	1/12 (8.3%)	0/2 (0%)

(1/12). All three patients had adenocarcinomas. There was no patient whose asymptomatic brain metastasis was detected by MRI among the 76 patients with T1-2N0, four with T3N0-1 and five with T4N0-2.

## Discussion

The purpose of this study was to determine the value of routine screening for brain metastasis in patients with potentially resectable primary lung cancer. Asymptomatic brain metastasis detected by MRI was observed in three adenocarcinoma patients who had either T2N1, T2N2 or T3N2 disease. There were no patients with brain metastasis who had either a T1 or T4 status while all three patients with the brain metastasis had clinical nodal metastasis. These observations suggested that brain metastasis appeared to be more strongly associated with nodal metastasis than T factor, and with adenocarcinoma.

The present results showed that unless swollen lymph nodes were detected on chest CT, no brain metastasis was detected by MRI. In light of diagnosis for cerebral metastasis, Grant et al.<sup>15)</sup> and Bilgin et al.<sup>16)</sup> concluded that routine preoperative brain CT can eliminate unnecessary thoracotomies, and The Canadian Lung Oncology Group reported that full investigation including brain CT for all patients including asymptomatic cases may reduce the number of unnecessary thoracotomies.<sup>17)</sup> The MRI screening of brain metastasis is more effective for distinguishing asymptomatic brain metastasis than CT.<sup>18)</sup> Therefore MRI would eliminate unnecessary thoracotomies.

However, Tanaka et al. reported that routine brain MRI was not recommended due to its cost and its role in increasing the mental duress of the patients, since the examination period is the most stressful time for cancer patients.<sup>19)</sup> Concerning the incidence of asymptomatic brain metastasis, Cole et al.<sup>20)</sup> advocated that neither MRI nor an enhanced CT scan is indicated for preoperative staging unless some clinical findings are observed. Hochstenbag et al.<sup>21)</sup> also reported that the incidence of

brain metastasis was only 3% in NSCLC patients with clinical stage I and II disease before brain MRI screening. In a consensus report of International Association for the Study of Lung Cancer<sup>22)</sup> and American Thoracic Society and European Respiratory Society,<sup>23)</sup> brain MRI is therefore not considered to be essential for the initial staging of NSCLC.

In conclusion, routine brain MRI is therefore considered to be unnecessary in patients who are considered to have potentially resectable diseases, no distant lesions, and no neurological symptoms.

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