

USEFULNESS OF BRAIN SCANS IN METASTATIC CARCINOMA OF THE LUNG

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The usefulness of brain scans for detecting unsuspected cerebral metastasis in patients with carcinoma of the lung was studied in a group of 35 such patients who had had routine brain scans as part of the initial evaluation. Seven (20%) had scans that were positive for tumor, but six of these seven had neurologic deficits corresponding to the brain-scan abnormality. Routine brain scans for evaluation of carcinoma of the lung are not justified if neurologic examination is normal.

Occult metastases are frequently the cause of failure to obtain a cure by surgery and radiotherapy in patients with carcinoma of the lung (1,2). In patients with suspected metastasis to the central nervous system, careful physical examination is important but still may fail to detect metastatic disease if the tumor is present in a silent area of the cortex. The incidence of cerebral metastasis from carcinoma of the lung at autopsy is approximately 25% (3), and, moreover, the most common cause of cerebral metastasis is carcinoma of the lung (4,5). For these reasons, routine brain scans are usually part of the initial evaluation in this condition.

This study sought to determine whether routine brain scanning is useful in detecting silent cerebral metastases. We reviewed the brain scans of all patients with carcinoma of the lung referred to us during 1974 for evaluation, and we compared the results with the clinical examination. Brain scanning did not usually detect cerebral metastasis in patients without focal neurologic deficits.

METHODS

We reviewed the clinical charts of all 35 patients who had had brain scans for evaluation of carcinoma of the lung. The initial decision to perform brain

scanning, made by the attending physician, often was based on the finding of neurologic abnormalities (20 patients). However, 15 patients showed no neurologic deficits, and these scans evidently represented a routine search for occult metastases. Scans were not always performed at the time of initial diagnosis and some may have been ordered because of the development of neurologic signs or symptoms. All scans were performed within 10 days of the neurologic examination. The patients were all men, ranging in age from 45 to 80 years.

Each patient was given an intravenous injection of 10–15 mCi of ^{99m}Tc-pertechnetate following oral administration of 400 mg of potassium perchlorate. All scans were performed approximately 5–15 min after injection, using a Searle Radiographics Pho/Gamma III scintillation camera with a 250-keV fine parallel-hole collimator. Five views of the brain were obtained: anterior, posterior, right and left laterals, and vertex. Brain scans showing a round or oval area of increased uptake on at least two views were considered positive for tumor. Scans with no areas of increased uptake, or with doubtful ones, were considered to be negative for tumor.

RESULTS

There was no correlation between the results of brain scanning and either age or histologic type of tumor.

Seven of the 35 patients (20%) had a diagnosis of brain tumor by brain scanning (Table 1). Six of these seven patients had focal neurologic deficits that could be correlated with the specific area of the brain found to contain tumor by scan. The remaining

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patient had only decreased pupillary responses, a nonspecific finding. Only one patient had brain tumor confirmed by craniotomy.

All 15 patients with normal neurologic examinations had normal brain scans. Thirteen other patients had neurologic abnormalities despite normal brain scans. Six of these 13 had nonfocal or nonspecific abnormalities, which may explain the nondetection by standard brain-scanning techniques. One patient with Parinaud's syndrome and another with probable carcinomatous meningitis provided examples of intracranial abnormalities seldom detected by scanning. The remaining seven patients had focal abnormalities but normal brain scans, perhaps because the lesions were too small to be detected or because the neurologic lesions were not tumors. One patient had metastatic tumor in the cerebellum at autopsy; both the neurologic examination and brain scan were normal in this patient.

DISCUSSION

Seven of the 35 patients who had brain scans for evaluation of carcinoma of the lung had scans that were positive for metastatic tumor. Six of these seven had focal neurologic deficits, however, and in these six the neurologic findings enabled the clinician to suggest the site of brain metastasis. In only one case was a metastatic lesion found by scan when the neurologic examination was nonspecific. None of the 15 patients with completely normal neurologic examinations had abnormal brain scans.

Unnecessary surgery may be avoided if unsuspected metastatic disease is discovered by brain scanning. In the present series no unnecessary surgery would have been done if brain scans had been performed only on patients with some neurologic abnormality. We therefore wonder whether brain scans should be done only on patients with some type of deficit, focal or not. Positive brain scans were found in 46% of those with focal abnormalities, but only in 14% of those with nonfocal findings.

These results and others (1,2) suggest that brain scanning is not likely to show brain metastases for which there is no neurologic evidence. The practice of routine brain scanning for all patients with carcinoma of the lung is therefore called into question. The high percentage of cerebral metastases found at autopsy in patients with carcinoma of the lung (3)

TABLE 1. CORRELATION OF BRAIN SCAN AND NEUROLOGIC EXAMINATION

Brain scan	No. of patients	Neurologic examination		
		Normal	Nonfocal	Focal
Positive	7	0	1	6
Negative	28	15	6	7

does not necessarily justify brain scanning in all such patients.

The discovery of focal neurologic deficits was not always associated with positive brain scans. Brain scanning may not detect certain metastases (e.g., some cerebellar lesions or lesions smaller than 1 cm in diameter), but the majority of cerebral metastases (71-88%) can be detected by scanning (5,6). Some of the neurologic abnormalities may have resulted from nonmetastatic disease.

We recommend that brain scanning be performed in any patient with carcinoma of the lung who manifests some abnormality of the central nervous system, particularly the finding of a focal deficit. If the neurologic examination is normal, however, the routine use of brain scanning in these patients does not appear to be justified, because of the rarity of positive brain scans in such patients.

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