SCANNING OF LIVER AND BRAIN IN EVALUATION OF PATIENTS WITH BRONCHOGENIC CARCINOMA

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With the progressive incidence of bronchogenic carcinoma, there will be an increasing need for diagnostic procedures that help in evaluating patients with brochogenic carcinoma for therapy. An increasing percentage of these patients is being managed by attempts to attain cure through surgery and radiation therapy. Moss has stated that "75% of these patients with resectable carcinoma die from metastases undetected at the time of surgery" (*1*). Any procedures that might help assign a patient to a therapeutic regimen that is either potentially curative or distinctly palliative in nature is beneficial.

Brain-scanning techniques have shown a consistently high positive correlation with proven metastatic spread of a variety of primary malignancies. Metastatic deposits in the liver also occur with relatively high frequency, although the size of the liver makes demonstration of smaller metastatic deposits more difficult. Depending to a moderate degree on the selection of the radioisotopic agent used and the equipment that is available for the scanning procedures, it is generally felt that metastatic deposits must attain diameters of approximately 1½–2½ cm before they can be distinctly demonstrated by scinti-scanning techniques in the brain or liver.

Postmortem studies on patients who died of bronchogenic carcinoma have shown a relatively high incidence of distant metastatic spread to the brain and liver (*2–6*). The postmortem series that were reported indicated that about one third of all bronchogenic carcinoma patients will have liver metastases and about one fourth will have brain metastases. These figures include those in which metastatic deposits that were found were 1 cm in dia or less and would be unlikely to be found by routine scanning techniques.

The symptomatology referable to the metastatic involvement of the brain and liver have often been the presenting symptoms that eventually led to the diagnosis of bronchogenic carcinoma (*2,6*). However, relatively large metastatic lesions can be asymptomatic at the time the bronchogenic lesion is diagnosed (*2,4,5*). It is in demonstrating the latter type of metastatic deposit that the radioisotope techniques might prove particularly useful.

Because of the relatively high frequency of metastatic spread to the brain and liver, it was felt that a series of patients with proven bronchogenic carcinoma should be examined by routine brain-scanning and liver-scanning techniques to determine what proportion of patients had abnormalities on the scans that would be consistent with metastatic spread to these organs. Eighty-three patients with proven bronchogenic carcinoma were examined by one or both of these radioisotope techniques and were studied to provide the case material for this report. Sixty-four brain scans were performed using primarily ^{197}Hg-Neohydrin as the isotopic agent and 50 liver scans were made with either ^{131}I-rose bengal or ^{198}Au-colloid as the isotopic agents. A Picker 3-in. Magnascanner with hexagonal 19-hole collimator was used in nearly every study performed.

CASE MATERIAL

The patients included in one or both series were studied at the time of initial diagnosis of primary bronchogenic carcinoma at the University of Kentucky Medical Center or the Veterans Administration Hospital in Lexington, Kentucky. A proven diagnosis of bronchogenic carcinoma was made in each case. No attempt has been made to try to correlate matastatic involvement to histological tumor type.

Forty-one males and nine females made up the

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liver-scan series. The age range was 37–83, with an average of 55 years. The patients in the brain-scan series included 57 males and seven females with an age range of 39–79 and an average of 57 years.

The hospital record of each patient was reviewed for presence or absence of signs, symptoms or other test data that would suggest possible metastatic spread to the liver or brain at the time of initial diagnosis. The records were also reviewed for later development of metastatic spread, or evidence of metastatic involvement in the brain or liver in those patients on whom postmortem examinations were obtained.

RESULTS

Eleven patients in the liver-scan series and eight in the brain-scan series had positive scans in which there was strong evidence of metastatic spread to the respective systems at the time of initial diagnosis. In five of the brain-scan series and four of the liver-scan series the metastatic involvement produced the clinical changes that prompted hospitalization resulting in the diagnosis of bronchogenic carcinoma (see Table 1 for results).

An additional patient in each series had equivocal scan findings and suggestive supportive findings. The patient in the liver-scan series expired 1 month later, and multiple small metastatic deposits were found in the liver at postmortem examination. The patient in the brain-scan series expired at home, but no postmortem study was obtained for confirmation.

Twelve patients in the brain-scan series and seven patients in the liver-scan series had negative scans despite suggestive findings supporting metastatic spread to the respective organs. In the follow-up time available or evidence obtained at postmortem examinations, none of these patients developed evidence of later metastatic spread.

Two patients in the liver-scan series and one patient in the brain-scan series had positive scans consistent with metastatic spread but without any signs or symptoms suggesting metastatic involvement. The patient with the positive brain scan also had large metastatic deposits in the liver and the initial diagnosis of bronchogenic carcinoma was made from liver biopsy. The two patients in the liver-scan series were considered inoperable because of the size and site of their bronchogenic lesions, and they were referred to radiation therapy. The evidence of metastatic spread to the liver modified the therapeutic intent in each case.

Equivocal scan findings in patients without clinical findings that suggested metastatic involvement were recorded in two patients in each series. One of the liver-scan patients expired 6 months later, and no liver metastases were noted, although there was a diffuse increase in fibrous content of the liver. The other liver-scan patient died 1 month later, and diffusely spread, small, metastatic deposits 2–3 mm in dia were noted on postmortem study. One of the brain-scan patients expired 3 months after the scan with no history consistent with brain metastases. A postmortem study was not obtained. The other brain-scan patient in this group was considered inoperable and received palliative radiation therapy to the lung lesion. He was still alive 10 months after the initial studies. There was evidence of recurrent growth of the pulmonary lesion, but no clinical evidence suggesting metastatic spread to the brain.

TABLE 1. DATA ON LIVER AND BRAIN SCANS DONE TO EVALUATE METASTATIC SPREAD FROM BRONCHOGENIC CARCINOMA

		Liver scans	Brain scans
Number of patients examined		50	64
Males/females		41/9	57/7
Age range		37–83	39–79
Average age		55.6	57
Patients with clinical findings suggesting metastases	Scan positive	11	8
	Scan equivocal	1	1
	Scan negative	7	12
Patients without clinical findings suggesting metastases	Scan positive	2	1
	Scan equivocal	2	2
	Scan negative	27	40

Twenty-seven patients in the liver-scan series and 40 patients in the brain-scan series, who had no clinical findings to suggest metastatic disease to liver and brain, had negative scintiscans. Clinical evidence of spread to these organs at a later date was noted in one of the liver-scan patients and three of the brain-scan patients. The liver-scan patient had an enlarged liver with a tender edge shortly before death. The liver scan was not repeated. A 2-cm nodule of metastatic tissue was noted on the inferior margin at postmortem examination. Repeat brain scans were positive on two of the brain-scan series who developed symptoms and signs suggestive of brain metastases 6–8 months after the initial studies. The third brain-scan patient developed symptoms 4 months after the initial studies. A repeat brain scan was not obtained. He expired 1 month later, and no postmortem examination was obtained.

DISCUSSION

From the data obtained on these series of brain and liver scans done to evaluate patients with bronchogenic carcinoma, it is evident that there is good

probability of demonstrating distant metastatic spread in those patients in whom there is strong clinical suspicion of metastatic disease. In the liver-scan series there were 11 positive scans and one suspicious scan noted from 19 patients with clinical findings consistent with metastases. Eight positive scans and one suspicious brain scan were recorded from the 21 patients who had clinical findings consistent with metastatic spread to the brain.

Demonstrating metastatic spread to the liver and brain in patients without clinical findings was not very successful in this series of patients. Definitely positive scans were noted in only two of the 31 potential patients in the liver-scan series, and only one of the 43 patients in the brain-scan series. Equivocal scanning evidence was noted in two more patients in each series. The follow-up data that were available in each of these latter four patients support the feeling that no distinct evidence of metastases should have been noted at the time of the initial studies on these four patients.

The over-all impressions gained from this study are that routine scintiscans of the liver and brain are unlikely to demonstrate metastatic spread of bronchogenic carcinoma in those patients who have no clinical findings suggesting metastatic spread. The scintiscans have been moderately successful in demonstrating metastatic spread in patients with suggestive clinical evidence, particularly in helping to decide whether the clinical findings are related to metastatic spread of bronchogenic carcinoma or other diseases that could produce similar clinical pictures.

SUMMARY

Sixty-four brain scans and 50 liver scans were performed as part of the initial evaluation of patients with bronchogenic carcinoma. The scans were found particularly useful in differentiating metastatic spread from other causes of signs and symptoms in patients with clinical findings suggestive of metastatic spread to liver and brain. Positive-scan evidence consistent with metastatic spread in those patients without suggestive clinical findings was relatively unsuccessful, with positive scans found in only two of 31 asymptomatic liver-scan patients and in only one of 43 asymptomatic brain-scan patients. With the present technical limitations on the minimum size abnormality that can be readily demonstrated in these large organs, the chances of defining asymptomatic lesions are quite small.

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