Knowledge that lesions of the right and left cerebral hemispheres produce separate distinctive neurological changes, aside from those related to contralateral sensory and motor functions, is not new. This knowledge has not been exploited routinely in the performance of the neurological examination. The standard neurological examination emphasizes changes that a lesion produces in the contralateral extremities. Too little recognition is given the fact that lesions of each cerebral hemisphere also alter distinctive, fairly easily differentiated functions that are not lateralized to the opposite side of the body. These changes can be demonstrated in a number of ways. Reitan and others have shown that patients with lesions of the right cerebral hemisphere do relatively poorly on the performance part of the Wechsler-Bellevue Intelligence Scale, and fairly well on the verbal tests. The reverse is found to be true for patients with lesions of the left cerebral hemisphere, who do poorly on verbal testing, but do better with the tests of performance. These differences can be demonstrated for lesions in any part of the cerebral hemisphere, but are most striking if the lesion lies in or adjacent to the parietal lobe.

Differences in the functions of the right and left parietal lobes were emphasized by Critchley in 1953. His findings have been confirmed by others. In most human brains, lesions of the left parietal lobe produce dysfunction of language while spatial orientation is distorted by lesions that involve the right cerebral hemisphere.

With the expectation that tests can be devised to detect more subtle dysfunctions of the brain than are demonstrated during the usual careful neurological examination, a neuropsychology laboratory has been established at Indiana University Medical Center. During the past 9 years about 2,000 individuals, some with lesions of the nervous system, and some normal controls, have taken a battery of tests based on those used by Dr. Ward C. Halstead of the University of Chicago, with some additions and subtractions. The routine psychological testing requires about a day and a half for administration, and a wide variety of functions are scrutinized. Among other things, the results of the tests can lateralize accurately lesions to the right, the left, or both cerebral hemispheres. One of the several methods by which lateralized lesions of the brain can be detected is the subject of this investigation.

METHOD OF TESTING

Language dysfunction and distortion of spatial orientation are tested routinely during the administration of a modification of the Halstead-Wepman Aphasia Screening Test. Four of the 36 aphasia subtests administered to the patients are especially pertinent to this study, and will be discussed and demonstrated. Three of the 4 tests are designed to detect difficulty in copying simple geometric figures, and all 4 are used to
detect dysfunction of language. In the first 3 tests, the patient is shown separately line drawings of a square, a Greek cross and a triangle (Drawing 0). He is asked: 1) to copy the outline of these figures without lifting his pencil from the paper; 2) to name each of the figures; and 3) to spell the name of each one. In the fourth test, the examiner says the sentence, “He shouted the warning!”. From this auditory stimulus, the patient is asked to repeat the sentence, explain it, and then write it.

Requiring the patient to perform a task seldom practised, such as drawing a geometric figure or writing a rarely used sentence or thought, is a meaningful test of language and related abilities. If he is directed to write or perform a frequently practised act, such as signing his name, this “overlearned” function often can be reproduced when many other aspects of the function of language are impaired severely.

As wide a variety of patients as possible were tested for this study. The patients were tested once, or more often if changes in status seemed sufficient to indicate repetition. Each patient was subjected to the standard battery of tests, administered in a standard way to eliminate, as much as possible, uncontrolled variables in the testing situation. Without learning the results of the aphasia testing, the clinical record of each patient was scrutinized carefully to determine the accuracy with which lesions of the brain could be detected and localized by all available diagnostic measures. Patients were selected for inclusion in the study only if sufficient information was presented from the neurological examination, roentgen-ray contrast studies, surgery or autopsy to state that a lesion of the brain was demonstrated. They were included if enough evidence was gathered to place the lesion in one cerebral hemisphere or to demonstrate that it involved both. Three groups were formed: 1) patients with lesions of the left hemisphere; 2) patients with lesions of the right hemisphere; and 3) patients with lesions involving both hemispheres. If any questions arose regarding the presence or location of a lesion, the patient was not included in the study. The clinical evidences from which conclusions about the localization of the lesion in each patient were drawn were those that guide a neurological surgeon in the choice of patients for surgical management. Since the decision regarding the need for surgery must be made frequently by the clinician who deals with diseases of the nervous system, we concluded that any test of function of the brain should be required to add information pertinent to this decision. The position of the clinician will be strengthened by development of additional methods that contribute reliable and valid information. Ease and briefness in administration of such tests are advantageous, but it is also important to realize that the information upon which a diagnosis is based should be drawn from as broad a domain of evidence as possible in order to understand more fully the complete significance of the brain lesion for each patient.

Patients with multiple sclerosis were not considered with the group discussed, because signs of unilateral destruction of the brain can so often be misleading in this disease. On the other hand, patients with a variety of pathological entities which may offer misleading localizing information were included, if there was definite evidence of involvement of the right cerebral hemisphere, the left cerebral hemisphere, or both. Lesions caudal to the tentorium or between the cerebral hemispheres were omitted, because the magnitude of secondary involvement of the cerebrum is so variable in these cases. Lesions caused by trauma, neoplasms, and vascular anomalies or occlusions were included, because the position of maximal involvement usually can be localized. Since the full details of cerebral pathology probably cannot be discerned with the usual clinical diagnostic