Optimizing the Detection of Hepatic Metastases

The radionuclide liver scan is a sensitive tool in the detection of hepatic metastases. However, even with the improved spatial resolution afforded by newer cameras, the liver scan detects only about 80% of liver metastases that are confirmed by invasive techniques (1–3). To enhance their ability to detect a greater percentage of those livers harboring metastases, investigators have devised numerous modifications of the procedure in which the data are acquired or in which they are processed. As spatial resolution has improved, the degradation of the image because of respiratory motion has become of increasing importance. To minimize motion artifacts, techniques using simple breath holding (4), upright positioning (5), analog circuitry (6–8), respiratory gating (9–10), and a computer (11–12) have been used. Emission multiplane tomography has also been used to give better definition of liver abnormalities either deep in the liver or in the porta hepatitis (13). Such techniques have provided improved lesion detection and greater overall accuracy than standard imaging. Greater emphasis has also been placed on the diagnostic criteria used by the observer in determining whether a given scan is normal or abnormal (14). Hepatic metastases from different source organs tend to generate different scintigraphic patterns.

Newer imaging modalities—such as computerized axial tomography (CAT) and grayscale ultrasound (US)—have enhanced the clinician’s ability to detect certain abdominal lesions. Evaluations comparing these modalities with radionuclide imaging (RI) in the detection of hepatic neoplasms are few; but they suggest that CAT and US are less sensitive but more specific than RI (15–19). Both CAT and US are definitely complementary to RI, for they can reduce the false-positive RI studies associated with the porta hepatitis, gallbladder fossa, cystic lesions, and thinning of the left lobe. It remains to be seen whether the sensitivity of CAT can be increased by the use of shorter scanning times (2–5 sec) and routine use of contrast enhancement.

In another approach, investigators have sought to optimize the radionuclide liver scan by evaluation of the impact of clinical data [e.g., ancillary tests such as serum alkaline phosphatase (AP) carcinoembryonic antigen (CEA) or aspartate aminotransferase (SGOT)] upon the accuracy of the scan diagnosis (20). In a group of patients with breast cancer and hepatic metastases, the composite test (abnormal liver scan by liberal criteria and CEA > 1.0 ng/ml) was shown to decrease false-positive (FP) results to 0% compared with 14% for the scan alone, while maintaining the same 89% true-positive (TP) rate. Other composite tests (e.g., abnormal AP and CEA > 2.5 ng/ml; abnormal SGOT and CEA > 2.5 ng/ml) were not as sensitive or specific. McCartney et al., in a subgroup of patients with colorectal and other G.I. malignancies with hepatic metastases, demonstrated that the liver scan (using strict diagnostic criteria) had a TP rate of 84% and a FP rate of 5%. As would be expected with the composite test (abnormal scan and CEA > 9 ng/ml), the TP rate fell to 61% with a FP rate of 0% (21). The interpretive criteria applied and the source of the hepatic metastases are obviously important parameters in the assessment of the value of such composite tests. Previously, Drum demonstrated that strict interpretive criteria for colorectal hepatic metastases yielded the same TP rate, yet a lower FP rate than did the liberal interpretive criteria (14).

In this issue of the Journal, Aburano et al. have gone one step beyond the detection of hepatic metastases by radionuclide liver imaging or by composite test including the liver scan. Their 327 patients with colorectal or other gastrointestinal malignancies underwent
The composite test was positive in an additional 17 patients with hepatic metastases (50% TP, 3% FP). After disjoint application of the scan and the composite test, the overall TP rate was 85% (against 70% for the scan alone) with an FP rate of 4%. Despite this significant improvement in sensitivity (P < 0.05), the authors emphasize that the overall accuracy of the scan or composite test was better than the liver scan alone (92% against 89%), whereas the predictive value of the scan or composite test was less (92% against 97%). However, the differences noted in this study are not statistically significant (P > 0.05), and the predictive value and overall accuracy are highly dependent upon disease prevalence in the population studied.

To assess the real value of this approach, one must explain why the 70% TP rate achieved after the scan alone is lower than that achieved in other studies (84–89%) using identical diagnostic criteria. The improvement in sensitivity (70% to 85%) achieved by disjoint application of the scan or composite test in the current study is no different from that achieved previously from scan alone. The lower TP rate from scan alone seen in the current study may be due to a) a greater percentage of patients with earlier disease, b) a lower detection rate in patients imaged with the rectilinear scanner, or c) unexplained differences in observer performance.

It would be of great interest to see whether the disjoint application of this composite test to a series such as that of Drum (14) or McCartney (21) would show significant improvement in the TP rates in their series. If detection of hepatic metastases is optimized by such a technique, it would provide an improved means of determining which patients should be further studied for hepatic metastases by invasive means such as percutaneous or peritoneoscopic liver biopsy.

REFERENCES


**BOOKS RECEIVED**


