EDITORIAL

Immunoscintigraphy For Lung Cancer Detection: Reality Testing

IMAGING TESTS FOR LUNG CANCER DETECTION

The development of new imaging modalities will continue to play a central role in the development of better tests for cancer screening and staging. Radiologic studies enjoy a special advantage over many other medical tests because all-important localization occurs in concert with detection. There is no better illustration of the practical importance of joint localization and detection than in the heavy reliance on mammography for the detection of non-palpable breast cancers.

In the case of lung cancer, effective screening tests remain an important public health challenge because incidence and mortality remain high, and large segments of the population continue to smoke cigarettes. The growing health risk from lung cancer is emphasized by new statistics showing lung cancer superceding breast cancer as the most common cause of cancer death among women (*1*). Chest radiography with (*2*) or without (*3*) supplementary sputum cytology can detect lung cancer at an earlier stage than controls, but screening with this conventional modality is not thought to reduce overall lung cancer mortality (*4*). It is clear that the search for an effective new lung cancer screening test should look beyond conventional radiography and sputum cytology.

IMMUNOSCINTIGRAPHY

Radiolabeled monoclonal antibody to lung cancer tumor-associated antigen (*5*) provides an attractive new imaging vehicle for cancer detection. In this issue, Biggi and colleagues describe the use of immunoscintigraphy with ^{111}In-labeled anti-CEA Mab (Type Fo23C5) for lung cancer detection (*6*). This investigation is a pilot study rather than an detailed test of the actual screening utility of immunoscintigraphy for lung cancer detection. Biggi et al. report that 57 of 63 patients with confirmed lung cancer and 6 of 11 controls with other non-lung cancer chest diseases had positive uptake of the isotope. The high test sensitivity (0.90) is promising but not necessarily what can be expected if an actual screening program were conducted. The patient population on which the data are drawn are likely to be quite different from actual screening populations where the detection of minimal disease is at a premium. In fact, Biggi and colleagues report that false-negatives tended to occur in lesions < 2 cm diameter, and in those in the perihilar region. The inclusion of six small-cell cancers in the study group suggests that the high sensitivity may partly be due to advanced disease in some cases. We do not have any precise knowledge of the stage of the lung cancer lesions reported by Biggi et al., nor do we know the relative performance of conventional chest radiography in this group. It is likely that conventional radiography would have a good chance of detecting the small peripheral lung cancers missed by immunoscintigraphy. It is unfortunate that immunoscintigraphy joins conventional radiography in exhibiting rather low sensitivity to perihilar lung cancer lesions.

REALITY TESTING

The utility of a cancer screening test depends ultimately on its ability to detect early disease *and* reduce mortality in the screened population by early treatment intervention. Conventional radiographic screening for lung cancer can accomplish the first criterion for utility but it has not yet been shown to meet the second aim. The cost of screening programs depends on the intrinsic cost of the test itself *and* the added cost and morbidity of false-positive tests that lead to other unnecessary procedures. The low specificity of immunoscintigraphy (0.45) in the small control group used by Biggi et al. is quite disturbing because it implies lack of tumor specificity of the antibody preparation and/or low signal-to-noise of radionuclide in the tumor. The use of immunoscintigraphy in its present form would be likely to lead to high added cost and morbidity from false-positive tests. Although we have knowledge of the actual false-positive rate that would occur if immunoscintigraphy were applied to normal rather than non-cancer chest disease controls as used by Biggi et al., it still appears that a large fraction of false-positives would be a considerable risk. In chest radiography, it is known that the false-positive rate is in the range of 0%–10% per conventional radiographic examination for lung cancer (*7*).

In its present form, immunoscintigraphy is unlikely to be a practical, or robust screening method for early lung cancer detection. The sensitivity offers little, if any, advantage over chest radiography and the false-positive rate may be very high. Few subjects will be willing to take the additional time (and cost) involved in a return hospital visit for imaging the after radionuclide injection. Even if immunoscintigraphy became inexpensive and convenient, there seems to be little to recommend it over radiography.

Although it is possible that improvement in the radionuclide antibody preparation may increase the signal-to-noise in tumor, it is hard to be very optimistic about the potential of immunoscintigraphy in lung cancer detection. A much simpler conventional form of imaging may actually do the job better. Detection of lung cancer with immunoscintigraphy is

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analogous to picking up a straight pin with a front-end loader. Much more than the pin will be scooped up, and a great deal of effort will be required to cull out the pin. It is easier to stoop over and pick up the pin in the conventional way. The quest for a more effective test for early lung cancer detection should look beyond both conventional radiography and immunoscintigraphy as it exists today.

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Erratum

In the September 1991 issue of the *Journal*, the captions for Figures 1 and 2 in the article, "An Analysis of Cerebral Blood Flow in Acute Closed-Head Injury Using Technetium-99m-HMPAO SPECT and Computed Tomography," by Steven N. Roper et al, were placed incorrectly. The corrected captions and figures are reprinted below.

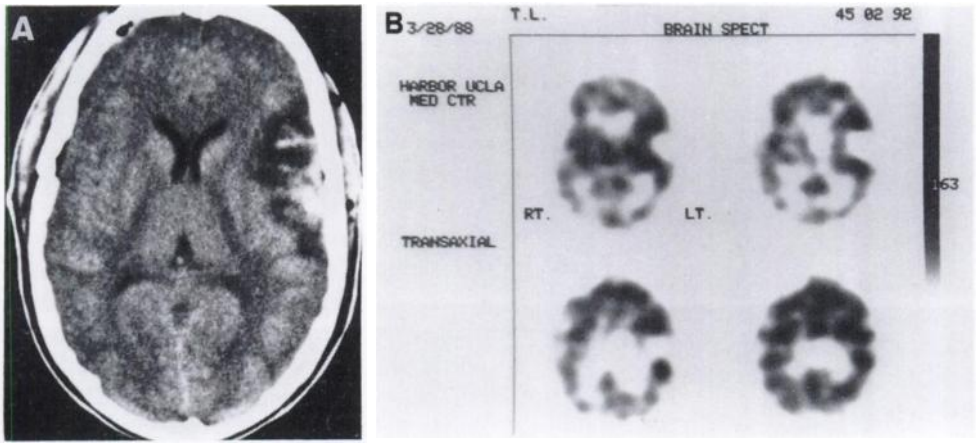

FIGURE 1. Imaging studies from a 45-yr-old male who was thrown from a horse. XCT (A) shows left occiptial contusion and SPECT (B) shows decreased CBF in both occipital lobes.

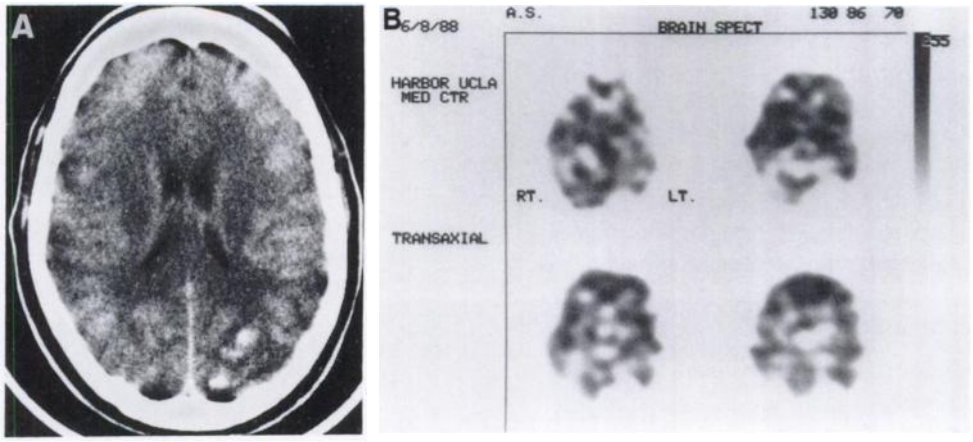

FIGURE 2. Imaging studies from a 19-yr-old male who suffered a non-penetrating gunshot wound to the left temporal are. XCT (A) shows a left frontotemporal contusion. SPECT (B) shows decreased CBF in the left frontotemporoparietal, right frontal, and right occipital areas.

ADDENDUM

Please note the following change for the article "Reorientation of the Left Ventricular Long-Axis on Myocardial Transaxial Tomograms by a Linear Fitting Method" by He et al, which appeared in the September issue of the *Journal* (pages 1794–1900). On page 1796, line 9, the statement: (using $y = ax + b$, where a was the slope of the fitted line and b the intercept on the y-axis of the fitted straight line in the transferred coordinate) *should be changed to*: (using $y = bx + a$, where b was the slope of the fitted line and a was the intercept on the y-axis of the fitted straight line in the transferred coordinate).