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Characteristics of a Radionuclide Monitoring of Cardiac Function and ST-Segment

TO THE EDITOR: We read with much interest the paper by Broadhurst et al. (*J Nucl Med* 1991;32:37-43) concerning the validation of a new probe to monitor cardiac function and ST-segment. This cesium iodide nuclear probe appears to be a noninvasive and easy means of continuously monitoring global left ventricular ejection fractions (LVEF) and ST-segment. One of the main advantages of such a probe is its high sensitivity to detect changes in left ventricular function, even before symptoms (1) and electrocardiographic signs (2) appear. We totally agree with most of "ideal detector system" characteristics defined by W.N. Breisblatt (*J Nucl Med* 1991;32:44-47) in order to increase sensitivity, but we would like to underline certain points.

The type and the number of leads are crucial to the sensitivity of long-term ambulatory electrocardiography. Bipolar lead CM-V5 appears to be the most sensitive, but CM-V3 increases ischemia detection by 10% (3). CM-V5 alone could be insensitive in cases of a previous inferior myocardial infarction or when ischemic changes are restricted to anteroseptal leads (e.g., leads V1, V2, V3) (4). Therefore leads CM-V5 and CM-V3 can examine anterolateral ischemia and modified lead aVf can examine that of inferior ischemia (5). Unfortunately, no data were available in the paper of Broadhurst concerning this point. The nuclear VEST permits only the recording of a modified V5 (6).

The duration of ambulatory electrocardiography greatly influences diagnostic sensitivity, especially if the nocturnal period is covered. Indeed, the distribution of ischemic episodes over a 24-hr period in chronic stable angina displays a distinct circadian rhythm, with the maximum amount of episodes occurring between 6 am and midday (7). A similar peak incidence of myocardial infarction has been described (8). If ^{99m}Tc is used, its relatively short half-life will hinder the study of the last part of the night. The use of a radioelement with a long half-life like ¹¹¹In could lead to an increased sensitivity. The study of regional ejection fraction is known to improve the detection of myocardial ischemia. In a summary of 12 published studies (totalling 771 patients), Gibson and Beller (9) reported that the radionuclide angiogram had a sensitivity of approximately 90%, when both failure of a rise in ejection fraction and presence of a new regional wall motion abnormality were required for the test to be deemed positive. As proposed by Breisblatt, study of regional wall motion appears to be an "ideal" characteristic, but it does not necessarily require online imaging. The use of a multi-crystal probe in which

the different detectors could be separately recorded after accurate collimation is a low-cost alternative.

In order to achieve these features, an original nuclear probe is now being developed in our laboratory. Three electrocardiographic leads will be recorded as five cesium iodide detectors (e.g., anterior, lateral, septal, inferior walls, and background activity). The option of online and offline monitoring are being considered. Use of ¹¹¹In will be evaluated. Preliminary results in vitro and in vivo appear promising (10).

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False-Positives in Immunoscintigraphy

TO THE EDITOR: We do not have sufficient clinical experience to evaluate the immunoscintigraphy of cancer by ourselves, although many clinical radioimmunodetections have been performed in European countries and in the U.S. We therefore appreciated the paper of Abdel-Nabi et al. (1) published in the December issue of the *Journal*, since it gave us the chance to show our case of a false-positive in immunoscintigraphy.

A 68-yr-old woman came to the hospital in January 1989 complaining of abdominal pain. A Ba-enema revealed a mass lesion in the sigmoid colon, which was confirmed as an adenocarcinoma by biopsy. In addition, a CT scan showed a low-density area in the right lobe of the liver, indicating metastasis of the colon Ca. The plasma-CEA level was 11 ng/ml at that time. She received 40 mg of antibody ZCE-025 labeled with 74 MBq of ¹¹¹In (1 mg of ¹¹¹In-ZCE-025 mixed with 39 mg of unmodified

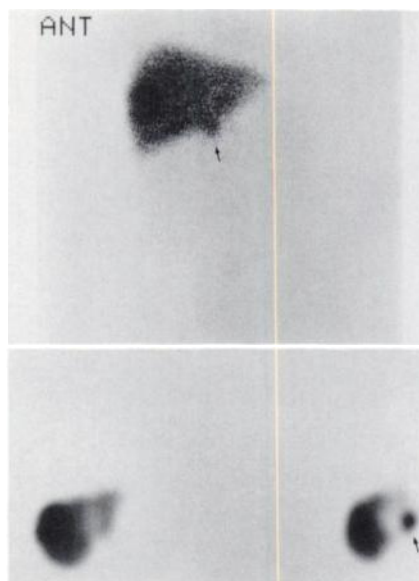


FIGURE 1. Planar and SPECT images.

antibody) in 100 ml of normal saline by slow intravenous infusion. Two days after infusion, planar and SPECT images were obtained. As shown in Figure 1, focal uptake of ^{111}In was clearly visualized in the lymph nodes at the site of the hepatic hilum as well as in the liver metastasis. We insisted that these two lymph nodes be resected during surgery, which was performed nine days after antibody injection, although the lymph nodes positively visualized in the scintigram were unlikely to be metastatic in the aspect of lymphatic flow. The localization index of two resected lymph nodes were much higher than that of the primary tumor in the colon (Table 1). Surgical exploration of lymph nodes, however, showed no gross or microscopic evidence of metastases of the colon Ca. The lymph node homogenates did not contain high CEA compared with those of the primary tumor or liver metastases (Table 1). The resected lymph nodes were stained positively by polyclonal anti-CEA antibody, but weakly by ZCE-025. The histology of the resected lymph nodes did not show any evidence of inflammatory lesions.

Beatty et al. (2) indicated shedding CEA as one of the causes of antibody localization in tumor-free tissues. In our case, the plasma-CEA level and the CEA contents in the lymph nodes

TABLE 1
Resected Specimens from Surgery

Resected samples	Localization index*	CEA contents† (ng CEA/mg protein)
Normal colon tissues	—	17
Primary tumor tissues (in sigmoid colon)	4.58	771
Normal liver tissues	—	19
Liver metastases	1.69	862
Lymph node 12b ₁	160	86
Lymph node 12b ₂	5.30	37

* Radioactivity/g of resected tissues/radioactivity/g of normal colon tissues.

† Resected samples were homogenized with phosphate buffer and their CEA contents were measured by the enzyme-like assay followed by the determination of protein concentration.

were not high enough to support their idea completely. Abdel-Nabi et al. (3) also reported some possible mechanisms for nonspecific accumulation in lymph nodes. In the plasma obtained from the patient, free ^{111}In , not attached to the antibody, could not be found. The fact that great uptake of ^{111}In was seen in only two distinct lymph nodes and not in the regional ones cannot be explained. Kairemo et al. (4) reported a false-positive finding in a patient with a parapharyngeal hemangiopericytoma. They pointed out that the antibody recognized new epitopes nonspecifically. We have believed that ZCE-025 did not react with normal granulocytes. Eventually this fact has raised doubt about the efficacy of immunoscintigraphy amongst surgeons, although this might apply to only a few cases among many clinical radioimmunodetections.

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Diagnosing Prosthetic Joint Infection

TO THE EDITOR: We have read Dr. Alazraki's interesting editorial on diagnosing prosthetic joint infections (1). We share Dr. Alazraki's view that some serious difficulties are related to the use of ^{111}In -labeled leukocytes for the diagnosis of prosthetic joint infections. In a recent paper, we reported our first experience with ^{111}In labeled human nonspecific immunoglobulin G (IgG) scintigraphy in patients with bone and joint infections (2). Five patients with prosthetic joints were included in this study. Since that time, scintigraphy with ^{111}In -IgG was performed in an additional 35 patients with prosthetic joints.

Of the 40 patients studied, 34 had total-hip arthroplasty and 6 had total knee prostheses. All patients had clinical signs of loosening and/or chronic infection. A conventional $^{99\text{m}}\text{Tc}$ -methylene diphosphonate skeletal scintigraphy was abnormal in all patients. All patients also underwent scintigraphic imaging after intravenous injection of 1 mg IgG (Sandoglobulin, Sandoz AG, Nuremberg, FRG) radiolabeled with 75 MBq ^{111}In (^{111}In -chloride, Amersham International Ltd., Buckinghamshire, UK) at 4, 24 and 48 hr (2). Scintigraphic results were evaluated by bacterial cultures obtained at surgery in 25 patients and by clinical follow-up and serial radiography in 12 patients. Three patients had productive fistulae.