

should be considered as well since corticosteroids may result in cerebral atrophy (3), which changes the presentation of  $^{99m}\text{Tc}$ -HMPAO. The false-positive rates of CNS involvement in systemic lupus erythematosus patients could be high when comparing systemic lupus erythematosus patients with a long history of steroid use with normal healthy subjects. Therefore, an age-matched control group with similar steroid history may be necessary when establishing a SPECT database for the clinical application of  $^{99m}\text{Tc}$ -HMPAO brain SPECT in systemic lupus erythematosus patients.

We did find some correlation between SPECT findings and anticardiolipin antibody (ACA) assay. Of the 48 patients with positive SPECT findings, 20 (41.7%) had positive ACA assay results. Of the 24 patients with negative SPECT findings, only 4 (16.7%) had positive ACA assay results. There was a statistical difference, with a p value of 0.0292, using a Fisher exact test. Of the 24 patients with positive ACA assays, 20 (83.3%) had positive SPECT findings. This result is similar to Dr. Lass's findings.

We admire Dr. Lass's work in the application of  $^{99m}\text{Tc}$ -HMPAO brain SPECT in various connective tissue diseases. The presentation of  $^{99m}\text{Tc}$ -HMPAO brain SPECT may be different in these diseases because of different pathological mechanisms. We will say that there is still a long way to go for the application of  $^{99m}\text{Tc}$ -HMPAO brain SPECT scan in connective tissue diseases.

## REFERENCES

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## Continuous Ambulatory Radionuclide Monitoring of Left Ventricular Function

**TO THE EDITOR:** We read with interest the article by Mizuno et al. (1) and the accompanying editorial (2). Mizuno et al. (1) used an ambulatory left ventricular (LV) function monitoring device (the VEST system; Capintec, Inc., Ramsey, NJ) to compare changes in LV ejection fraction (LVEF) and LV end-diastolic and end-systolic volumes during supine and upright bicycle exercise in a group of 16 healthy volunteers. Although changes in heart rate and blood pressure were comparable in both exercises, the changes in relative end-systolic volumes and ejection fraction were significantly different. There was a fall in LVEF and an increase in relative end-systolic volumes during exercise in the supine position.

The authors explain this result as due to a limitation of the device in accurately tracking the changes in LV volumes during supine exercise, presumably related to the relative shift in detector position with deep breathing during exercise. Although this inference is logical, the clinical and practical implications of this finding need to be put in proper perspective. The major unrivaled advantage of the ambulatory LV function monitoring device (as its name implies) is its capability to monitor LV volumes and ejection fraction under a variety of ambulatory conditions. Supine exercise in clinical practice is not usually performed by choice, but rather due to a limitation of conventional gamma cameras, which require the patient's chest to be still while equilibrium radionuclide angiocardiology is performed. This is possible only when the patient is in the supine position. However, exercise in this position is often difficult, limited and somewhat unphysiological. This study was carried out in young, healthy

volunteers who were able to attain similar peak heart rates and blood pressure (and, presumably, similar peak workloads as well) in the supine position compared to the upright position. However, in a significant proportion of patients, supine exercise attains only a submaximum workload compared to upright exercise. If it is possible to monitor LV function reliably in the upright position, this is the preferred exercise modality. Therefore, the very purpose of the study by Mizuno et al. (1) is, to our minds, questionable from both a clinical and physiological sense. Why bother studying a phenomenon with minimal relevance when a more appropriate manner of study exists?

It should also be noted that supine monitoring of LV function may still be accurate, reliable and acceptable for monitoring silent ischemia and for studying the effect of pharmacological intervention on LV function over a period of several hours. In prior studies in which we monitored LV function for the detection of spontaneously occurring, unprovoked myocardial dysfunction and during routine physical activities in the convalescent period in patients with myocardial infarction and unstable angina, some of the patients were monitored in the supine position (3,4). In the absence of exercise we did not encounter any specific problems with supine monitoring.

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**REPLY:** We thank Drs. Jain and Zaret for their interest in our recently published study (1). A continuous ambulatory radionuclide monitoring system (the VEST system; Capintec, Inc., Ramsey, NJ) is a new technique of continuously monitoring left ventricular ejection fraction (LVEF) using standard principles of electrocardiographic-gated radionuclide ventriculography. The VEST system makes it possible to monitor LVEF during stress tests and silent myocardial ischemia and to evaluate cardiac function in daily life (2-4).

In our article, we assessed the reliability of the VEST system during exercise (1). Sixteen healthy volunteer subjects underwent measurement of left ventricular (LV) performance with the VEST system during ergometer exercise in the upright and supine positions. No significant difference was shown in the baseline data at rest between the upright and supine positions. LVEF increased significantly, as we expected, during ergometer exercise in the upright position. On the other hand, LVEF decreased during exercise in the supine position. Thus, in the supine position during exercise, the VEST system may give false data due to unsatisfactory data accumulation. Since the detector of the VEST system may be too small, data collection is impaired during exercise in the supine position because the heart may shift with deep respiration. To measure LVEF with the VEST system, the detector should be located on the center of the LV cavity and should remain in that position regardless of the heart's location relevant to the patient's body position. However, the heart is suspended, not fixed, in a space of the mediastinum. Thus, the position of the heart is easily shifted by different body positions. It is quite possible that the accumulation of VEST data could be false in some cases, not only because of respiratory movement of the diaphragm but also by position changes (i.e., standing, sitting, supine, and right and left lateral decubitus positions). For example, during an

episode of chest pain in patients with angina pectoris, we found that LVEF as monitored by the VEST system may decrease as a result of myocardial ischemia. However, LVEF values became lower than reported when a patient could not bear the strength of the symptom and took a deep breath in the supine or lateral decubitus position. Moreover, if the patient is anxious, he or she may hyperventilate, which may also cause a decline in LVEF in supine patients with normal LV function. Such clinical episodes are often seen.

The VEST system is not a popular tool, but we believe that it is a very useful method of examination for the assessment of clinical research and drug intervention studies. However, as for the measurement by the VEST system, it is obvious that respiratory movement is influential, and LVEF values may artificially decrease. Decrease in LVEF during exercise is clinically important for predicting a patient's prognosis. The limitations of the VEST system should be kept in mind when it is used to assess clinical research and drug intervention studies. As we mentioned in the article (1), we concluded that the VEST system had been clinically useful in the upright position, but that it should not be used in the supine position. We agree with the opinion of Drs. Strauss and Ohtsuki that the VEST system should have position-sensitive capabilities in its next life (5).

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### FIRST IMPRESSIONS Prostate Cancer with Leg Pain

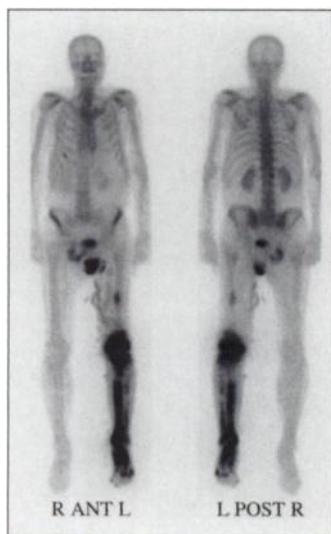


Figure 1.



Figure 2.

#### PURPOSE

Planar whole-body images of a 73-yr-old man with prostate carcinoma and atypical appearance of bone metastases on bone scintigraphy showed an unusual pattern of increased radiotracer uptake in the left distal leg with apparent expansion of the bone mimicking the typical appearance of Paget's disease (Fig. 1). These findings, together with the presence of elevated alkaline phosphatase, could lead to misinterpretation and misdiagnosis. A radiograph of the left femur, tibia and fibula (Fig. 2A, B) showed the presence of patchy blastic metastatic disease involving the distal femoral metaphysis and condyles and throughout the entire left tibia and fibula. The patient subsequently underwent surgical amputation of his left leg. The pathology report was consistent with intramedullary metastatic prostate carcinoma. This case should instill a note of caution when the differential diagnosis of Paget's disease is entertained on the basis of bony expansion demonstrated by bone scintigraphy. One should be aware of the possibility of appendicular skeletal metastases from prostate carcinoma to prevent error in patient management and inappropriate investigations. In case of doubt, standard radiography usually is adequate for differential diagnosis.

#### TRACER

Technetium-99m-MDP (25 mCi)

#### ROUTE OF ADMINISTRATION

Intravenous

#### TIME AFTER INJECTION

3 hr

#### INSTRUMENTATION

Dual-head Genesys gamma camera (ADAC, Milpitas, CA)

#### CONTRIBUTORS

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