more time after treatment to permit therapeutic benefit, patient selection, adjunctive treatments, etc—may modify the presence and impact of these collaterals.

Unfortunately, certain particulars have been omitted from the report. The difference between the areas of abnormality on the stress and rest images equals the amount of stress-induced ischemia. In the current study, if the overall defect size did not change and the rest defects got smaller, did the amount of inducible ischemia increase? After all, if the growth of collaterals enhanced rest flow and resolved resting defects, paradoxically, the amount of stress-induced ischemia may increase. In the current study, the ischemic variables were not included.

Also, there is no mention of which isotopes were used for the rest and stress images and whether all patients received the same protocol. It is difficult to interpret these results without knowledge of the agent used for the studies. If these were stress-redistribution thallium protocols, then the rest images would identify hypoperfused but viable myocardium, and these findings would suggest that the treatment yielded normal flow to previously hibernating regions. If the rest agent was a technetium Tc 99m sestamibi (^{99m}Tc sestamibi), the amount of improvement detected may be decreased, since many would claim that a 4-hour redistribution thallium image would detect more viability than a resting ^{99m}Tc sestamibi study.

Finally, it must be said that investigators who have participated in the various ongoing VEGF studies are unsure about the optimal agent and protocol for assessing this new treatment. Given these early, promising results and the important potential benefits of this treatment, we can be certain to see further studies.

Nuclear Cardiology

Incorporation of Electron Beam CT into Routine Testing Algorithms: Do We "Just Do It?"

Reviewed by Rory Hachamovitch, MD

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Two distinct phenomena have marked the medical landscape during the past decade. On one hand, a plethora of new technology has emerged, as evidenced both by the dramatic acceleration of the technology of the testing we currently use and by the development of new and exciting technology that may be added to our noninvasive testing armamentarium. On the other hand, the need to contain the costs of medical care has infiltrated our health care system and has shifted the process by which we evaluate technology. Thus, we now attempt to evaluate new technology by means of "evidence-based medicine." Simply put, we must now subject each new modality to strict criteria when evaluating its performance characteristics prior to its clinical acceptance (ie, reimbursement).

Among these criteria are the need for evidence that the new modality in question will be able to yield added or incremental value over that provided by the tests ordinarily performed prior to the new test. For stress imaging modalities, this is shown by demonstrating with an appropriate analysis that stress nuclear CT or echocardiography adds incremental value toward a defined diagnostic or prognostic end point after adjusting for clinical, historical, and treadmill testing information. The newest noninvasive testing modality, electron beam CT (EBCT), used to detect and quantify the extent of coronary artery calcification, is now the target of heated debate as to whether it adds incremental value over other sources of clinical information.

Identification of Patients at Increased Risk of First Unheralded Acute Myocardial Infarction by Electron Beam Computed Tomography

Raggi P, Callister TQ, Cooil B, et al.
Circulation. 2000;101:850-855.

Raggi and colleagues, from one of the premier EBCT centers in the country, reported on the use of EBCT to predict the occurrence of myocardial infarction (MI) in patients referred for evaluation with this test because of cardiac risk factors. The authors studied 2 cohorts: the first consisted of 172 patients whose MIs were their initial manifestation of coronary artery disease (CAD) and who underwent EBCT scanning shortly thereafter (3 to 60 days; mean, 31 days); the second consisted of 632 patients with no CAD history who underwent EBCT for evaluation of cardiac risk factors and were followed for occurrence of cardiac death or MI for a mean of 32 months. The goal of the authors was to compare the value of absolute calcium scores (a measurement of coronary artery calcification) in these patients with the calcium score percentile (from a large cohort previously tested) as predictors of adverse outcomes.

In the cohort of 632 patients who underwent screening with EBCT, both the absolute calcium score and the calcium score percentile (sex- and age-adjusted percentiles from a large series scanned at the authors' center) were predictors of adverse outcomes. The majority of the events occurred in the middle 2 quartiles of scores, and the highest quartile of calcium scores had the highest event rate. Because of the small number of patients with scores in this highest quartile, the total proportion of events that occurred in this quartile was low. According to the authors, the calcium score percentile appeared to be a better measure in this study than the raw calcium score because of the former's ability to identify a greater proportion of the events that occurred. Thus, evaluating calcium scores as a percentile may be a better means to apply this test as a screening tool in an asymptomatic population. In this study, with respect to the population evaluated shortly after MI, a significant proportion would have been identified as being at risk for adverse outcomes had they been screened before their MIs.

This article is representative of much of the EBCT literature. Published data in limited series suggest that EBCT:

- Strongly correlates with the amount of atherosclerotic burden present.
- Predicts the presence of CAD in selected populations.
- Is an excellent independent predictor of adverse outcomes.

Several major flaws, however, continue to haunt the EBCT literature. To date, the data published tend to be based on preselected populations with significant referral bias, and the populations tend to be small and inadequate for evaluating the end points the authors select.

Further, the analyses performed tend to be statistically flawed, particularly with respect to whether EBCT is more valuable than other information. In the current manuscript, information known about the patient prior to the EBCT is not adjusted for in the analyses. How many additional events would have been detected by EBCT after patients who were unlikely to experience events (based on their clinical information) were excluded? In addition, the authors of this and other EBCT manuscripts tend to use quartiles of scores. These quartiles are extremely sensitive to the population selected; it is difficult to apply results based on quartiles of 1 cohort to another population unless the cohorts are very similarly matched. Since the event rates in asymptomatic populations tend to be very low, the event rate in the lowest quartile will be extremely low, while it will be relatively high in the highest quartile. Although EBCT undoubtedly stratifies a population, is the relative risk high because of the test's performance or because of the analysis?

There is much to be optimistic about regarding EBCT's possible applications in the clinical community. Until the evidence is brought forth in well-analyzed, sufficiently powered cohorts, however, the support of this modality by guidelines will be delayed.

Hypertension

Scrutinizing Systolic Blood Pressure

Reviewed by Joseph L. Izzo, Jr, MD

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Systolic blood pressure (BP) is now achieving widespread attention as the more relevant clinical end point in hypertension. A recent Clinical Advisory update from the National Heart, Lung, and Blood Institute emphasizes this paradigm shift. Also included is a major criticism of a recent paper suggesting that systolic hypertension is benign.

A Clinical Advisory Statement: The Importance of Systolic Blood Pressure in Older Americans

Izzo JL Jr, Levy D, Black HR, for the Coordinating Co-mmittee of the National High Blood Pressure Education Program

Hypertension. 2000;35:(5).

A Clinical Advisory Statement on the importance of systolic BP was issued in May from the Coordinating Committee of the National High Blood Pressure Education Program as an adjunct to the recommendations of *The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (*JNC VI,* 1997). Based on the large amount of evidence currently available, the committee recommended a major paradigm shift in urging that systolic BP become the major criterion for diagnosis, staging, and therapeutic