

amine infusion before the decrease. By contrast, the observations of Cladellas et al. concern patients who failed to achieve an adequate heart rate response; it is not clear whether heart rate decrease occurred in any patient. As we reported, only 1 of 14 patients with paradoxical sinus deceleration was taking beta-blockers. We mentioned in our report that all our patients fasted for at least 3 h before dobutamine stress echocardiography; mild hypovolemia may have facilitated the occurrence of the vasodepressor response.

In our conclusions, we reported that paradoxical sinus deceleration was most often seen in patients with coronary artery disease, but in 14% of our patients with heart rate decrease, there were no angiographic, echocardiographic, electrocardiographic or clinical signs of coronary artery disease. Sinus deceleration was often accompanied by a decrease in blood pressure, nausea and chest pain. We believe that sinus deceleration during dobutamine stress echocardiography is typically mediated by the Bezold-Jarisch reflex and is most commonly seen in the presence of ischemia but may occur in its absence.

The echocardiographic signs of myocardial ischemia may be subtle if heart rate is not increased and can be best appreciated by continuous echocardiographic surveillance. Atropine is effective in increasing heart rate in patients with paradoxical bradycardia and is recommended in those with no manifestations of ischemia.

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F-18 FDG Uptake in Transplanted Heart

In their recent report, Rechavia et al. (1) concluded that a threefold increase in the uptake of the glucose tracer analogue fluorine-18 2-deoxy-2-fluoroglucose (F-18 FDG) in transplanted hearts reflects a preference for glucose as a substrate. The authors further concluded that this preference for glucose may be due either to inefficient utilization of glucose by the transplanted heart or to the influence of circulating catecholamines.

This observation can be explained entirely by a change in the relation between F-18 FDG and glucose. The latter is commonly referred to as the "lumped constant" (LC) (2). This ratio between tracer (F-18 FDG) and tracee (glucose) reflects the kinetic differences between glucose and deoxyglucose transport and phosphorylation. Most studies have used a fixed value of 0.67 to quantitate glucose uptake from the F-18 FDG tracings (3-5), but we (6,7) and others (8) have recently observed in the isolated working heart that the LC is subject to significant variability, depending on the metabolic environment. Insulin and competing substrates to glucose cause a decrease in the LC (6-8), whereas epinephrine and ischemia can cause an increase in the LC (unpublished observations). An increase in the LC causes an

overestimation of glucose uptake, whereas a decrease in the LC results in an underestimation of glucose uptake.

Thus, considering the results of Rechavia et al. (1) in light of the experimental findings (6-8), the concept of an increased LC in the transplanted hearts is in order. Such an increase would lead to the overestimation of glucose uptake. This effect may artificially introduce and accentuate otherwise minor differences in glucose uptake. The possibility of increased catecholamine sensitivity and the possible presence of chronic "demand ischemia" in transplanted hearts would argue in favor of this hypothesis.

A practical solution to this problem would be to determine the LC individually for every study from the time-activity curves of F-18 FDG accumulation (9). The results presented by Rechavia et al. (1) are undoubtedly interesting, but we caution against drawing any conclusions regarding the quantitation of glucose uptake or metabolism in transplanted human heart.

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Reply

In their comment on the report by Rechavia et al. (1), Doenst and Taegtmeyer make several important statements about the lumped constant (LC) for fluorine-18 2-fluoro-2-deoxy-D-glucose (F-18 FDG) and how changes in this variable would reflect on the quantitative assessment of myocardial glucose utilization with this method. They also surmise how the LC may differ between fasting conditions in normal subjects and in transplant recipients.

We agree with the view that it is important to develop an understanding of how the kinetics of F-18 FDG and glucose differ under varying pathophysiologic conditions in humans, but the absence of appropriate and unequivocal data means that predictions of how the LC might change clinically are still clearly speculative.