# Myocardial Viability

*70-year-old male*
*referred by his cardiologist*

## Patient History

- Patient had a history of an inferior wall myocardial infarction (MI). He presented with a second MI and severe congestive heart failure.
- He underwent cardiac catheterization to determine if revascularization were feasible, and might improve clinical status and long-term outcome. Coronary angiography showed a totally occluded right coronary artery (Figure 1), and a left anterior descending artery which was occluded proximally, and filled by collaterals (Figure 2).
- Contrast ventriculography showed severe hypokinesis to akinesis of the anterior, apical and inferior walls, severe mitral regurgitation, and an LV ejection fraction of 20%.

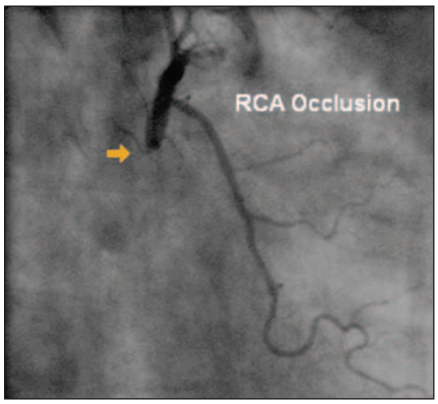


*Fig. 1*

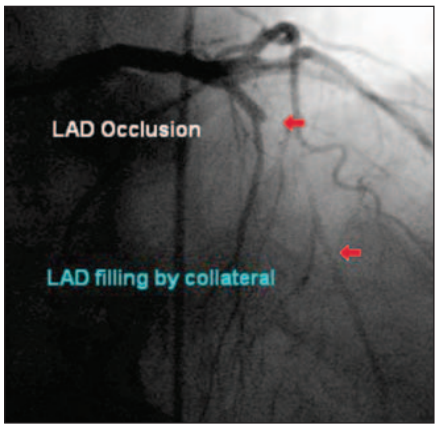


*Fig. 2*

## Treatment Planning

- Because his right coronary artery (RCA) and left anterior descending artery (LAD) were chronically occluded, he was not a candidate for percutaneous revascularization. His severe LV dysfunction and valvular regurgitation would ordinarily make him a poor candidate for cardiac surgery.

## Clinical Question

Is there any viable tissue? If some component of his LV dysfunction was due to hibernating, but viable, myocardium, then revascularization with coronary bypass could improve cardiac function and prognosis.

- ***A combined PET perfusion (rubidium-82) and metabolic study (18-FDG) was performed (Figure 3).***

## PET Findings and Teaching Points — Hibernating, Viable Myocardium

- The PET scans showed a severe perfusion defect in the anterior and apical walls (white arrows-LAD distribution), with intact 18-FDG uptake and metabolic activity in the corresponding segments.
- This pattern, termed perfusion/metabolism mismatch, is indicative of hibernating, viable myocardium.
- There is also a severe perfusion defect in the inferior wall (yellow arrows-RCA distribution), with severely decreased 18-FDG uptake and metabolic activity in corresponding segments. This pattern is consistent with myocardial infarction, and a low likelihood of viability.

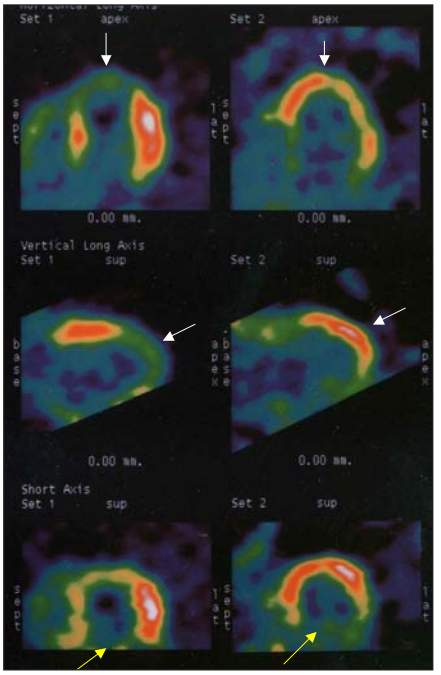


***Fig. 3** — On left, Rb-82 Perfusion Images. On right, 18-FDG Metabolic Images.*

PET FOUNDATIONS

*Case study courtesy of Andrew VanTosh, M.D. — Beth Israel Medical Center, New York, NY*

## Treatment

- Because the PET study showed a significant degree of viable myocardium in the anteroapex, the patient. underwent bypass surgery, with an internal mammary graft to the left anterior descending coronary, and mitral valve replacement.
- As predicted by the PET FDG study, at surgery the anterior wall was described as viable muscle, whose function improved immediately on revascularization. The inferior wall was described as showing extensive scarring and infarction.

## Outcome

- The patient had an uneventful post-op course and was discharged home, clinically improved.
- PET metabolic imaging with 18-FDG was thus the deciding factor in helping the patient's cardiologists determine that he did not have end stage heart failure, but, instead, had hibernating myocardium, and could be helped by cardiac surgery.

### *PET Protocols*

- *FDG Viability Study- 10 mCi. of FDG administered 1 hour prior to scan*
- *Rubidium Perfusion Study — 50 mCi. of Rb-82 administered one minute prior to the scan*

**Positron Emission Tomography (PET),** utilizing 18-fluorodeoxyglucose (FDG), is a well-recognized method to assess myocardial viability. FDG uptake equates with viability, and as many as 30%-50% of regions felt to be scar by standard nuclear tests are found to be viable with PET. Additionally, categorization of myocardium as viable versus non-viable has important prognostic implications. The identification of viability on the PET scan recommends revascularization, resulting in functional as well as symptomatic improvement in many patients.

*Reference:*
Travin MI and Bergmann SR: Assessment of myocardial viability. Semin Nucl Med 2005, 35:2-16.

## PET Allows for Differentiation

*"PET metabolic imaging with 18-FDG in patients with significant cardiac dysfunction allows the clinician to differentiate between those patients with 'hibernating' or viable myocardium, vs. those with irreversible infarction or scarring. The former group will benefit significantly, in terms of LV function and prognosis, from revascularization. In the latter group, revascularization is high risk, and may confer little advantage in long term outlook."*

*"A PET viability study with FDG is used by our cardiac surgeons and interventionalists as the most reliable method of identifying high risk patients who may still benefit from coronary revascularization."*

– **Andrew VanTosh, M.D.**
**Beth Israel Medical Center**

CardinalHealth

www.cardinalhealth.com
www.PETFoundations.com

Lit. No. 7PET0058-01 (5k) 2-06