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.

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).

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 anteroseptal region, 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:

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