



Molecular Imaging Services
Advanced Molecular Imaging Solutions



CARDIAC PET

Epicardial CAD in a Patient with Normal rest/stress PET Myocardial Perfusion but Abnormal Myocardial Blood Flow Reserve

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Case Summary

This case illustrates the value of myocardial blood flow assessment in patients with no known coronary artery disease and normal PET myocardial perfusion but abnormal blood flow in the identification of CAD



Case History

- 80-year-old patient with no known CAD presents with symptoms suggestive of angina
- History: paroxysmal atrial fibrillation, hypertension, pacemaker,
- Exercise capacity is limited
- Pharmacologic stress PET perfusion ordered to evaluate symptoms



PET Protocol

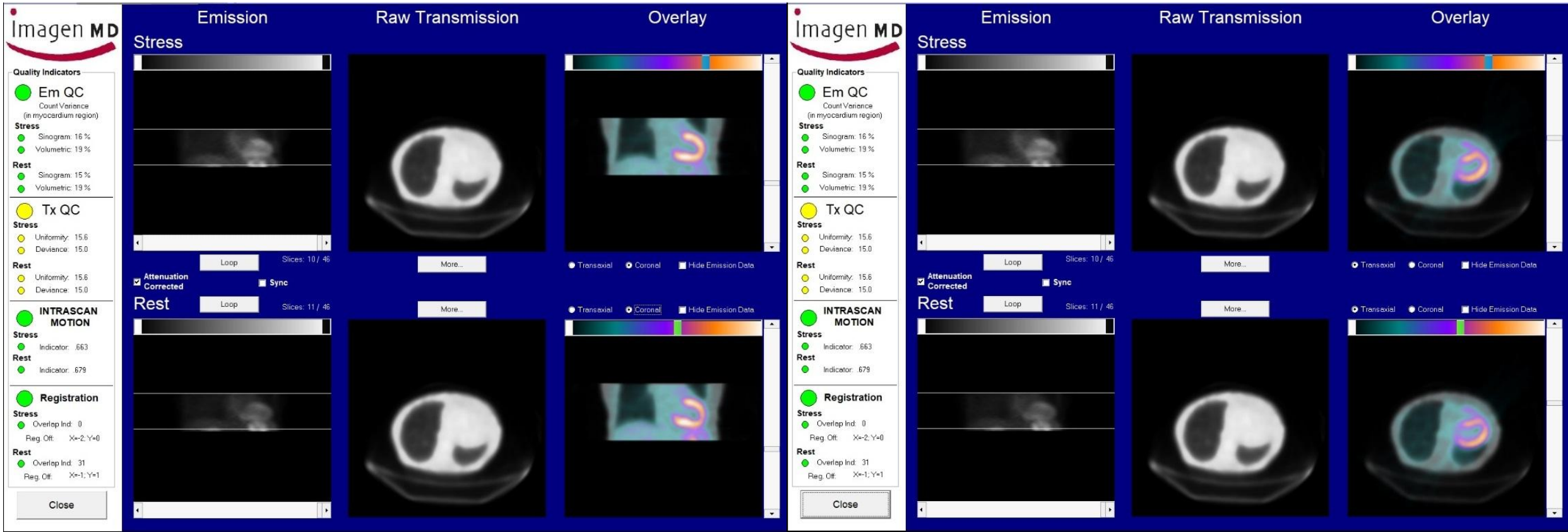
- Stress agent: regadenoson
- Stress ECG: intermittent a-fib, no ischemic changes
- Stress symptoms: shortness of breath, chest tightness, resolved
- Heart rate: rest 70 BPM and stress 93 BPM
- Blood pressure: 141/75 mmHg at rest, 132/65 mmHG at peak stress
- Isotope and administered activity: Rubidium-82, 30 mCi at rest and at stress
- Camera system: GE NXi with Net Retention software for myocardial blood flow



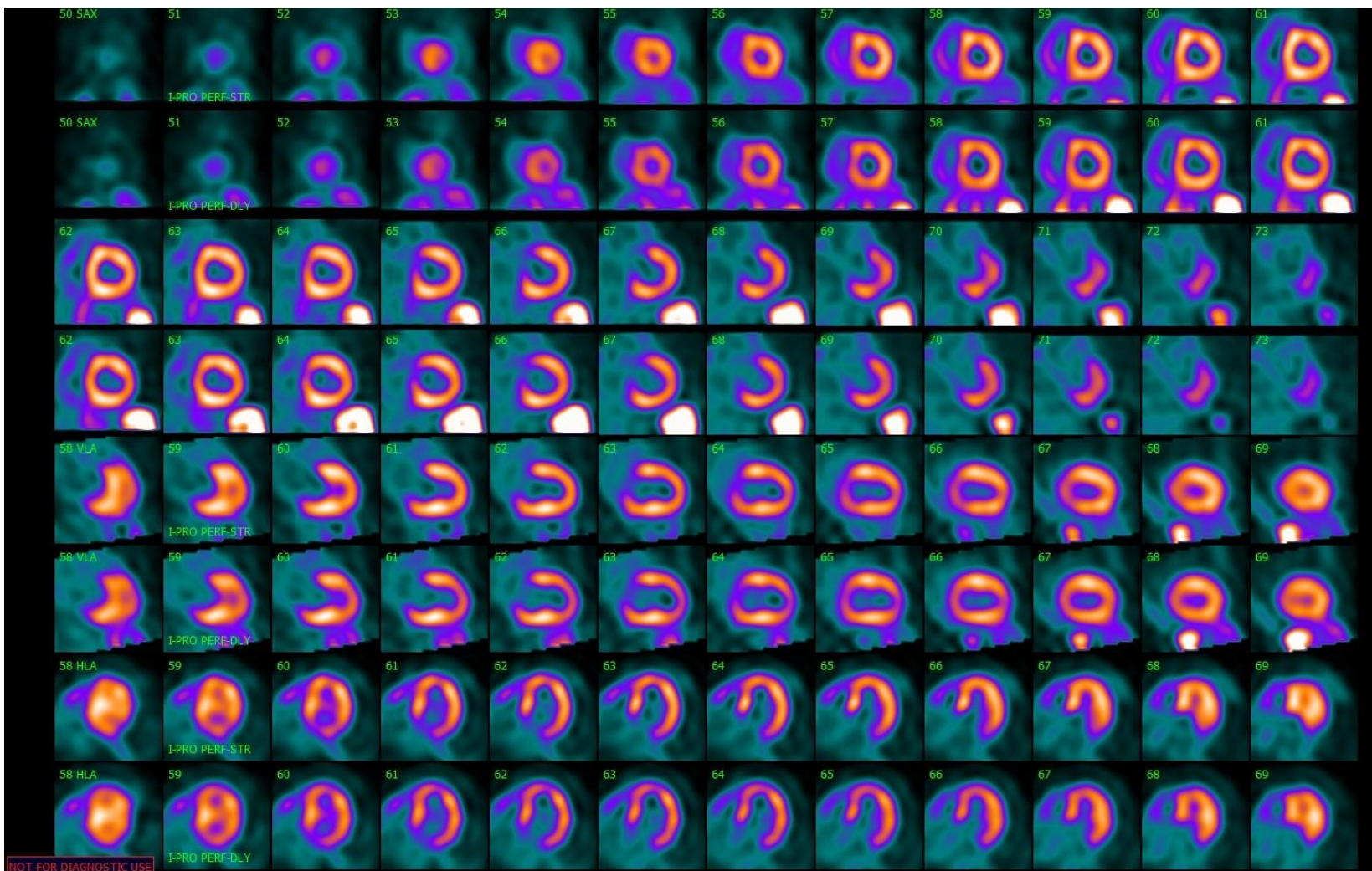
Quality Control

- No Misregistration
- Minimal motion artifact
- QC for myocardial blood flow excellent

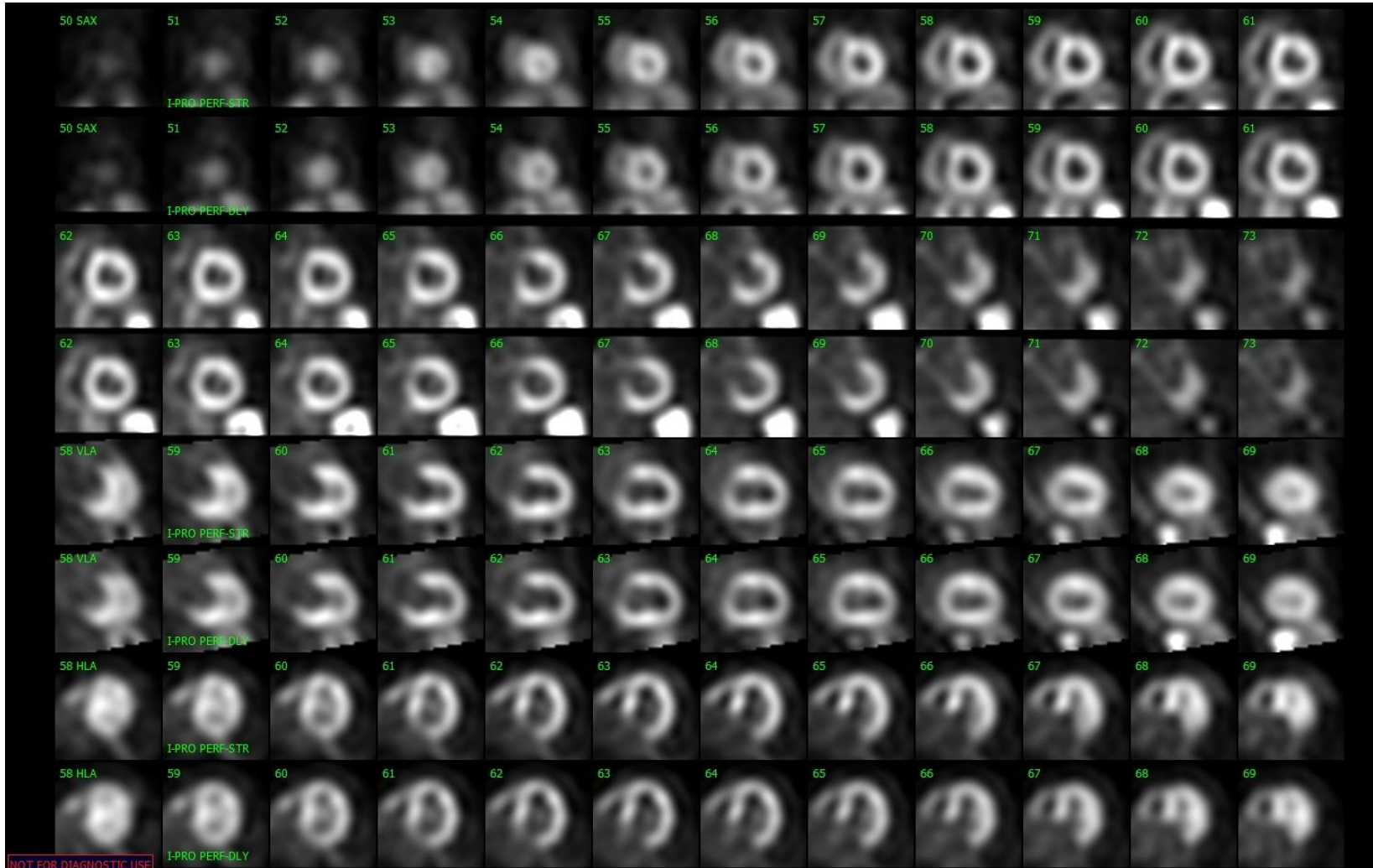




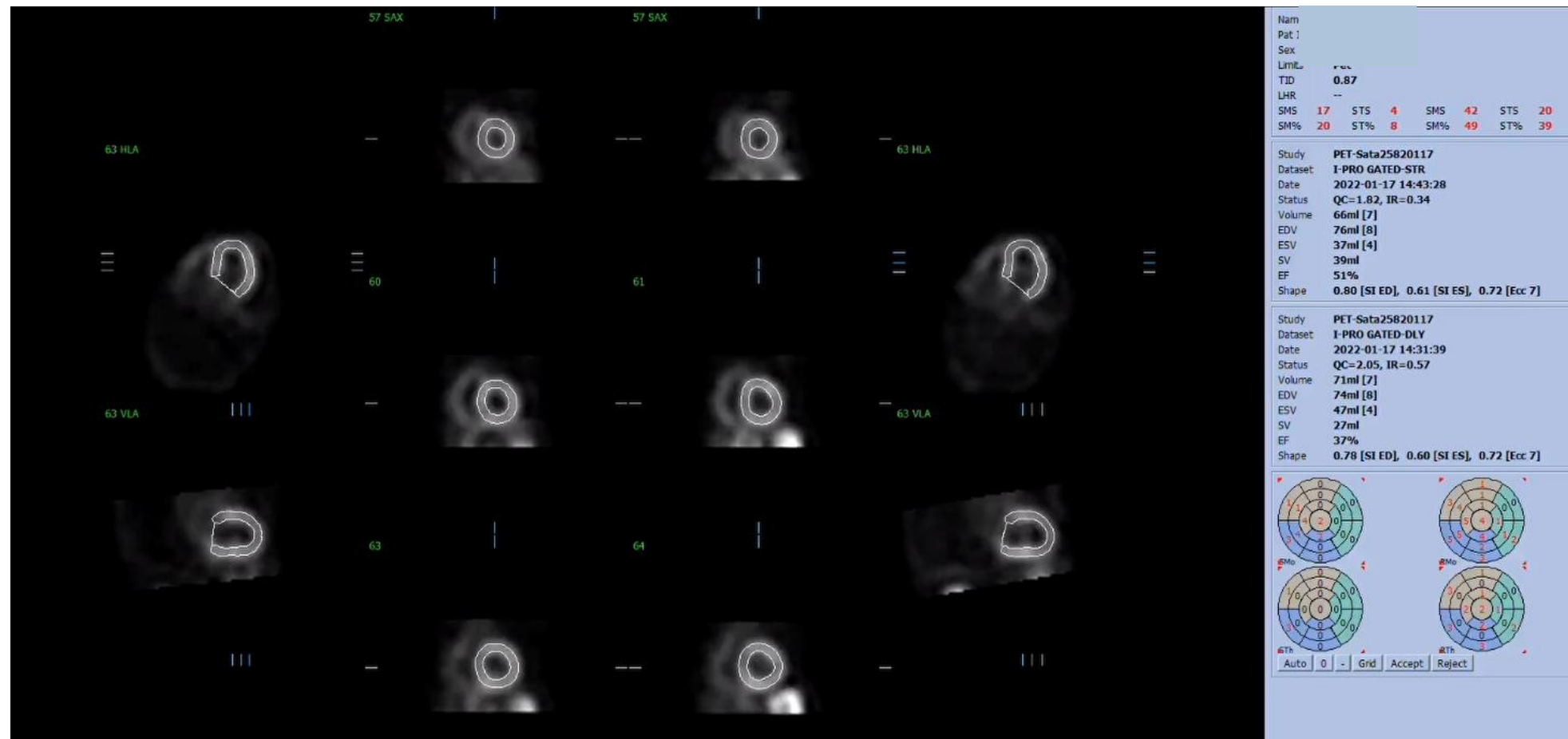
Cardiac PET Perfusion Data



Cardiac PET Perfusion Data



ECG Gated Stress and Rest Data

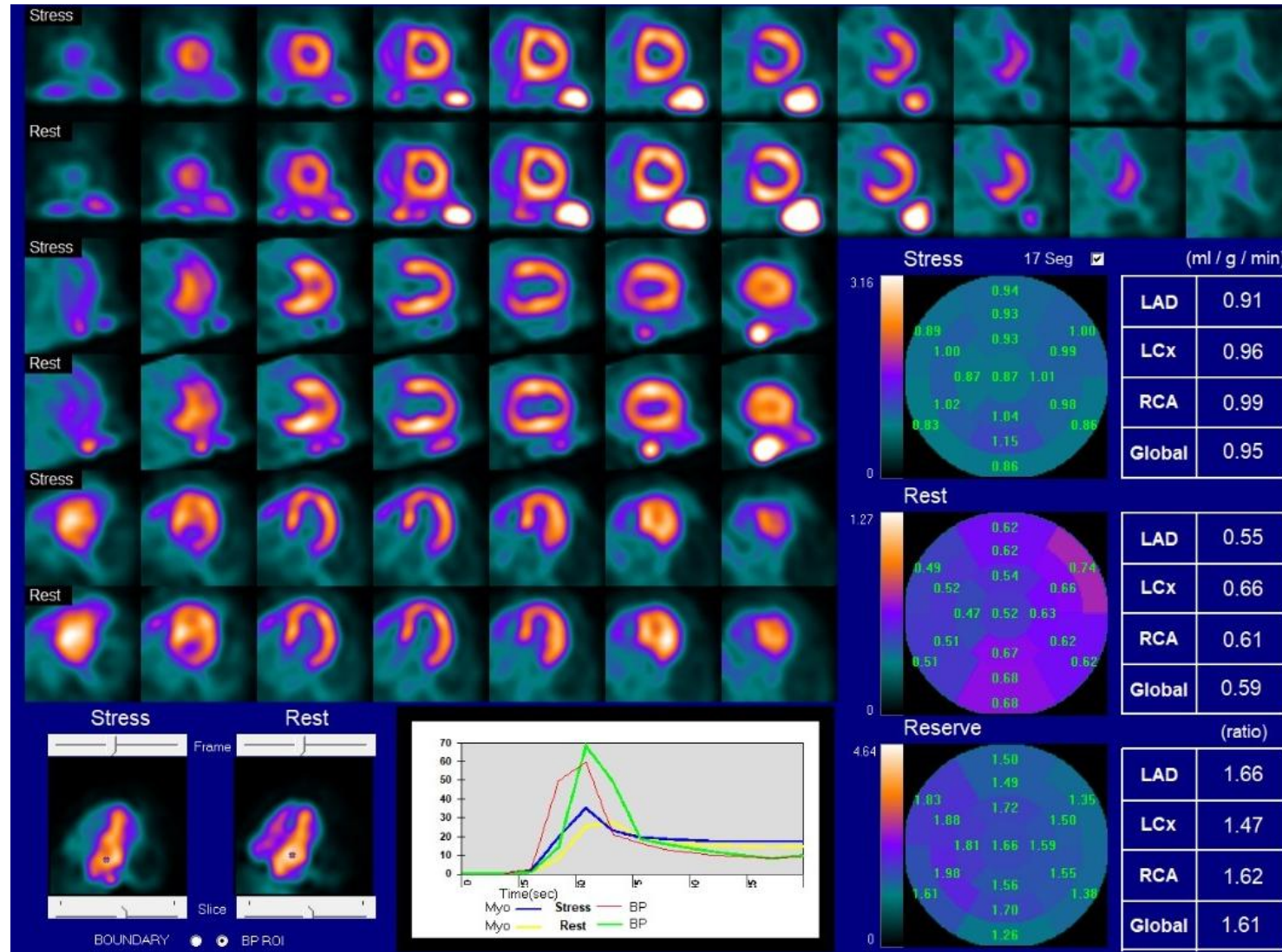


Interpretation, Perfusion and Function

- Myocardial perfusion: normal (mild apical motion) with normal TID ratio
- Myocardial function: normal global wall motion at rest and stress
 - EF 37% at rest, 51% at rest (patient in atrial fibrillation during gated images, previously normal echo)



Myocardial Blood Flow at rest, stress and reserve (net retention model for blood flow)



Myocardial Blood Flow Interpretation

- Good placement of cursors, adequate bolus at rest and stress
- Rest data: normal range, with minimal vascular variability
- Stress data: uniform increase in all 3 vessels but below normal
- MBFR: LAD 1.66, LCX 1.47, RCA, 1.62, Global 1.61 all abnormal, moderate

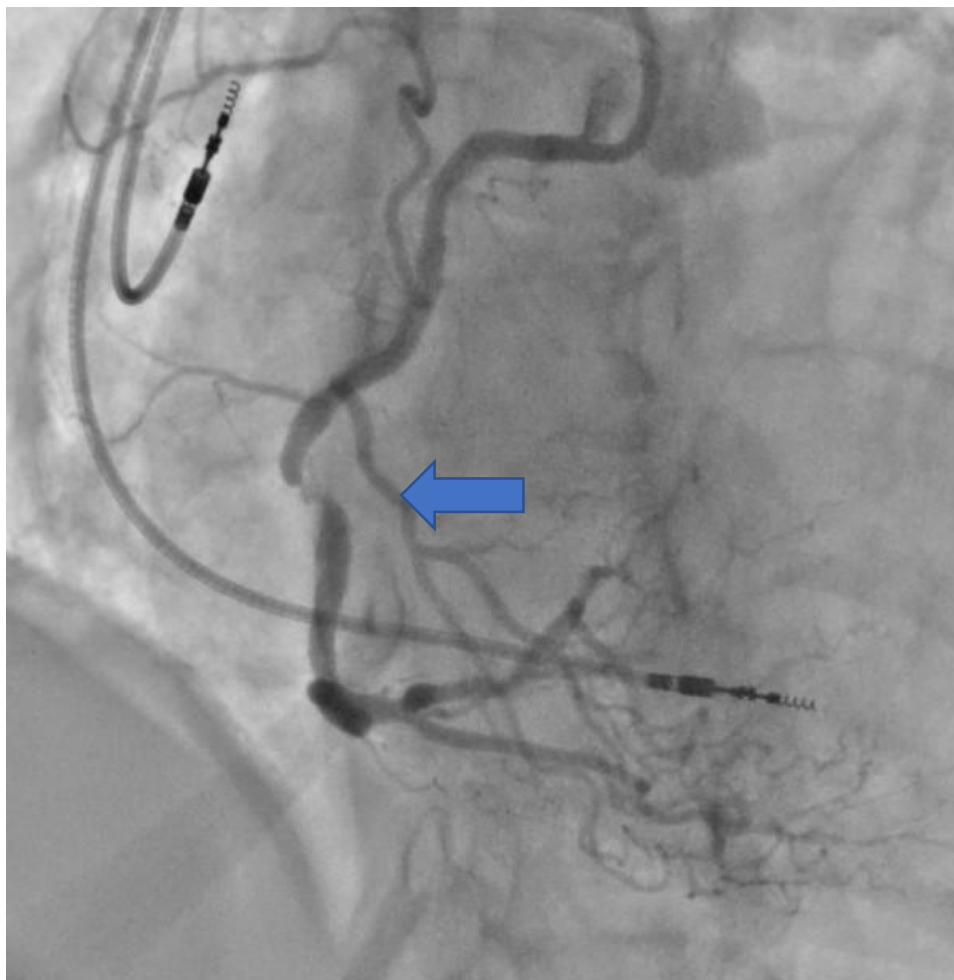


Clinical Evaluation

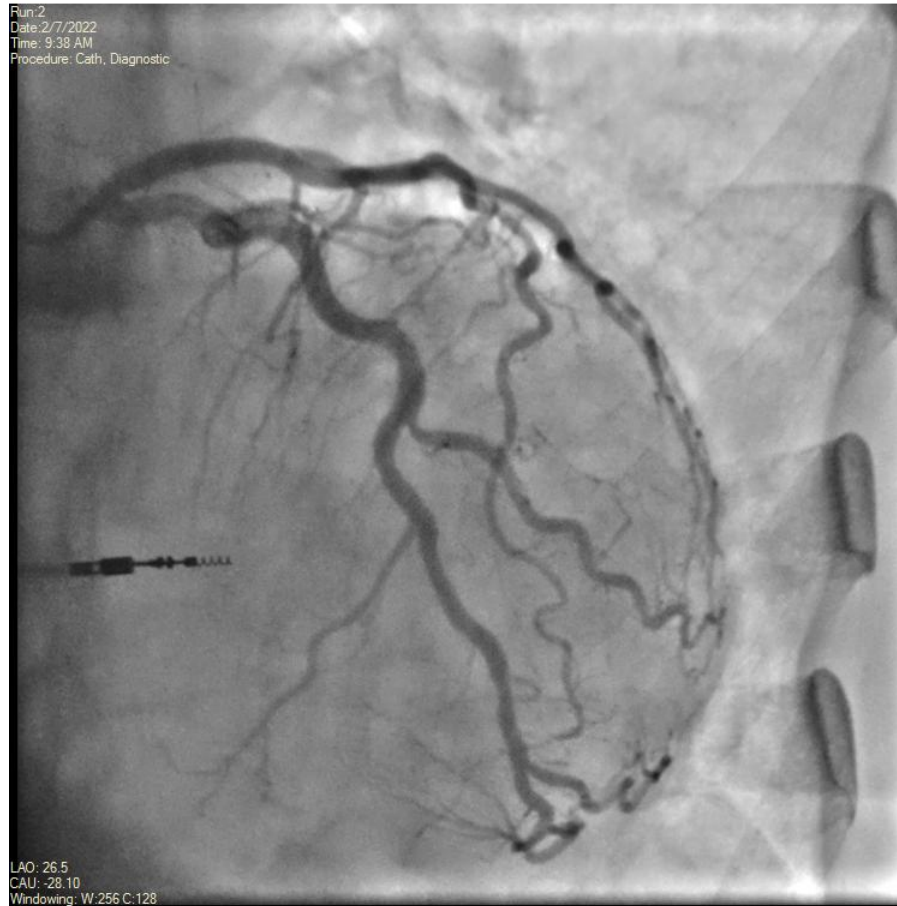
- Although myocardial perfusion was normal, myocardial blood flow reserve was abnormal, and ongoing symptoms, the patient underwent elective cardiac catheterization:
 - Left anterior descending: moderate diffuse disease
 - Left circumflex: 80% stenosis of obtuse marginal, not major vessel
 - Right coronary artery: 99% stenosis, mid (see figure)
- The RCA was considered culprit lesion, unsuccessful PCI due to inability to cross stenosis
- Medical therapy maximized



Cardiac catheterization: right coronary artery



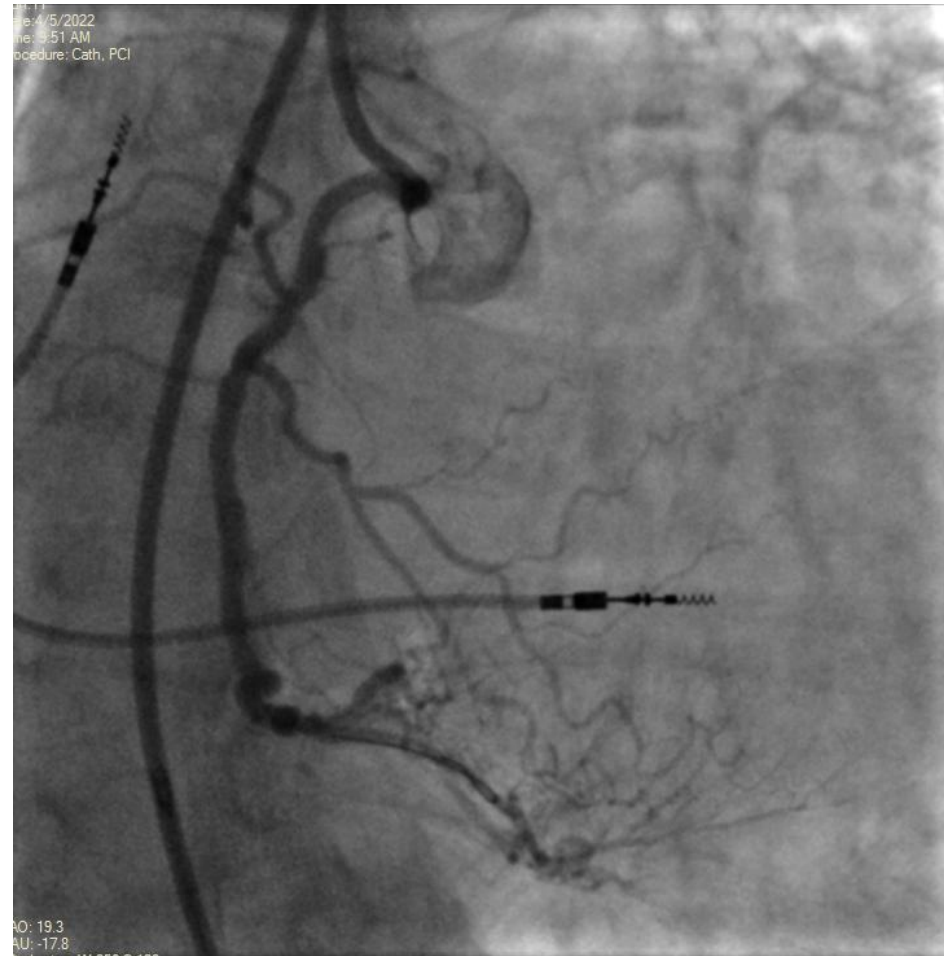
Cardiac catheterization: LCx and LAD



- Patient continued to have anginal symptoms 2 months following initial catheterization
- A second attempt for PCI of RCA was successful (see figure)



Successful PCI to RCA



Discussion

- This case demonstrates the value of myocardial blood flow assessment in patients with suspected CAD in whom myocardial blood flow reserve is abnormal, in which CAD has not been excluded (1)
- Risk for significant multi-vessel disease increases as MBFR decreases below 2, with the highest risk below 1.6-1.7 (2)
- Cardiac catheterization revealed 3 vessel CAD, the culprit lesion being the RCA, medical therapy maximized, and second attempt for PCI of RCA successful.
- Global decreased MBFR and culprit lesion in RCA on cath demonstrates major single vessel disease along with microvascular disease.
- Important CAD would have been missed and appropriate therapy would not have been administered if myocardial blood flow was not evaluated.
- This case illustrates the importance of further evaluation of abnormal MBFR even in the setting of normal perfusion



Teaching Points

- 1) Proper assessment of all blood flow data is important: rest, stress, reserve
- 2) Despite normal perfusion, the finding of abnormal blood flow indicates epicardial and/or microvascular CAD, and further evaluation is warranted
- 3) Cardiac catheterization demonstrated that epicardial CAD was present, but had the catheterization been normal, microvascular CAD would be considered
- 4) This study demonstrates the value of further assessment in patients with no known CAD and abnormal myocardial blood flow.



References

1. Murthy et al, Journal of Nuclear Cardiology 2018; 25:269-97
2. Bateman et al, Journal of Nuclear Medicine 2021; 62:1599-1615



Key Words

- Normal myocardial PET perfusion
- Abnormal myocardial blood flow reserve
- Epicardial coronary artery disease

