

# CORONARY ARTERY DISEASE: BLOOD FLOW MEASUREMENT REFINES CLINICAL DECISION-MAKING

Diagnostic tools that **ENHANCE CARDIAC PET SCANS** help clinicians determine when patients need further intervention.

**A patient with a prolonged history of shoulder pain attributed to arthritis**, sought medical attention. Because this pain could also be a sign of cardiovascular issues, the physician recommended an electrocardiogram (ECG) to keep tabs on the patient's heart health. Despite inconclusive ECG results, one test eventually revealed concerning cardiac changes, even though the patient's symptoms remained

▲ **Myocardial blood flow measurement tools can reveal real-time insights into a person's cardiovascular health.**

unchanged, unmasking the correct diagnosis and overturning the misattribution to arthritis.

Upon referral, interventional cardiologist Dr. Nils Johnson, a professor of medicine at McGovern Medical School at UTHealth in Houston, ordered a positron emission tomography (PET) scan with objective blood flow measurements. These measurements provide insights into total blood flow through the heart tissue. Understanding myocardial blood flow (MBF) has become increasingly crucial in managing coronary artery disease (CAD). Software

packages now allow clinicians to monitor MBF routinely during cardiac PET scans. This real-time data enables accurate CAD detection, reducing the reliance on older surrogate markers and invasive tests like heart catheterization.

In Dr. Johnson's case, MBF data from a heart PET scan played a pivotal role. It guided the treatment journey — from resolving an ambiguous clinical scenario to guiding initial noninvasive management and monitoring the success of later bypass surgery following disease progression. "Blood flow data helped us treat

this patient across his entire spectrum of care," he says.

Importantly, many patients may not need invasive diagnostic tests or treatment for their CAD. MBF measurement by cardiac PET helps physicians accurately identify those who should advance to an invasive evaluation, and those who shouldn't.

## MAKING THE RIGHT CHOICE

For decades, doctors have used cardiac PET scans to identify the presence or absence of CAD in people who have symptoms and/or risk factors.

The results can help clinicians with treatment planning and monitoring outcomes over time.

"Based on commonly used tests, patients often go on to the cath lab for an angiogram. But those who go to the trouble of getting one are frequently told they need no further interventions," says Dr. Johnson. "Ideally, cardiac PET could have told the patient upfront that an invasive angiogram was not needed."

Dr. Robert Bober, at Sutter Health East Bay Medical Group in Oakland, California, agrees that MBF data can improve patient selection for these treatments: "We can now measure blood flow all over the heart muscle and do it before the patient even enters the cath lab, meaning we can select the right people for procedures."

Dr. Bober suggests that the angiogram is not the gold standard cardiologists are taught to believe. The appearance of arteries during an angiogram can be deceiving, looking severely blocked or diseased. But MBF data often show that blood flow is acceptable. "The angiogram is actually the surrogate for flow. But it's become too easy for us to resort to angiography to find a blocked vessel that appears to decrease flow," he says. "We see a blockage on angiography and make assumptions. However, our cardiac PET data<sup>1</sup> show that many times the flow is adequate even with a blockage."

It's like checking the plumbing of a house. If the pipes are clogged, they will get fixed. But if the water flow is already good, no action needs to be taken. Similarly, PET with MBF data showing flow capacity helps doctors decide when to fix heart blood flow using stents or surgery.

## GO WITH THE FLOW

One such cardiology practice that took on the mantra of angiogram-as-surrogate is Memorial Katy Cardiology Associates in Cypress, Texas, which has used an MBF software package called HeartSee for the past two years. "At first, my partners at the practice weren't sold on the significance of the software," says Dr. James Feldman, a cardiologist at the practice. "As time has passed, they really can't see themselves reading nuclear imaging studies without it. We get so much extra data. It's helpful for all of us."

Dr. Feldman says that cardiologists can measure absolute flow per gram of heart tissue across different heart regions, and that the software allows them to directly see a patient's flow capacity, which clarifies their prognosis. "Most patients who have known or suspected CAD could benefit from MBF diagnostic tools because we can now quantitate flows, which is useful for determining medical management."

Drs. Johnson and Bober believe that this software helps interventional cardiologists avoid superfluous steps, so that their procedures can be more focused. "I've gotten the most exciting feedback when showing the interventionalists PET pictures with blood flow data," says Dr. Johnson. "We've designed them in such a way that it really focuses their attention when they get into the cath lab."

## BREAKING BARRIERS

For Dr. Johnson, using MBF software is an important part of making top-notch, PET-focused cardiac care more widely available. He highlights that when health systems and practices invest in PET, it's

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a considerable upfront cost, with ongoing investment in infrastructure and training. Part of deciding whether to make that investment to make that investment includes how they're going to approach patients with suspected CAD.

"Are they going to perform low-value invasive procedures, or do they want to screen first to see who actually needs to be there?" asks Dr. Johnson, adding that the time and money saved can be better focused on the subset of patients who actually need stent procedures or bypass surgery.

Though various MBF technologies are available, Drs. Johnson, Bober, and Feldman use HeartSee. In 2023, Dr. Bober's team investigated the accuracy of several software systems in measuring resting blood flow in regions with damaged heart tissue from a previous heart attack. They found that HeartSee provided precise and consistent measurements in these scarred regions, compared to similar software<sup>2</sup>.

Drs. Johnson and Bober have been working with Bracco, the healthcare company that markets HeartSee, to reduce barriers to this technology. "We are developing a Windows-based version of the software that allows for easy integration in hospitals and clinics," Dr. Johnson says, emphasizing that better technology means better patient selection and subsequently, better care. "This technology should be user-friendly and available for everyone." ■

## REFERENCES

1. Bober RM, et al., *Curr Cardiol Rep*, **23:50** (2021)
2. Bober RM, et al., *EJNMMI Res*, **13:87** (2023)



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