

# HEALTHY HEART

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## What Physicians Need to Know about OCT, FFR and IVUS

### Introduction

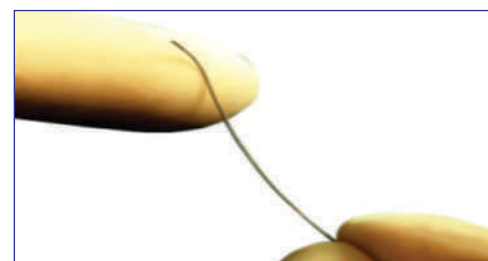
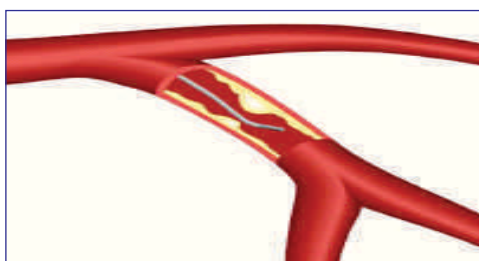
Coronary angiography remains the most commonly used imaging modality to describe the degree and extent of coronary atherosclerosis during diagnostic cardiac catheterization and percutaneous coronary intervention (PCI). Its accuracy is affected by technical limitations, important interobserver variability, and its poor visualization of the vessel wall. Furthermore, it provides limited information about the functional significance of the lesion.

Today, intravascular ultrasound (IVUS), fractional flow reserve (FFR), and optical coherence tomography (OCT) are extensively used to overcome the aforementioned limitations. Despite the increasing published data validating their

advantages, IVUS, FFR, and OCT remain largely underutilized.

Imaging technology and diagnostic tools for interventional cardiologists have changed dramatically over the past few years with the introduction of OCT,

improvements in IVUS and pressure guide wires used in FFR. Product innovation and integration of these technologies, as well as a growing base of clinical evidence, are transforming the way physicians diagnose, treat and follow-up patients undergoing PCI. IVUS allows physicians to visualize lumen diameter and vessel walls from within the vessel, providing better guidance for stent placement. In Japan however, IVUS has reimbursement and is used in more than 70 percent of PCI procedures.



**Fig. 1 - Fractional Flow Guide Wire®**

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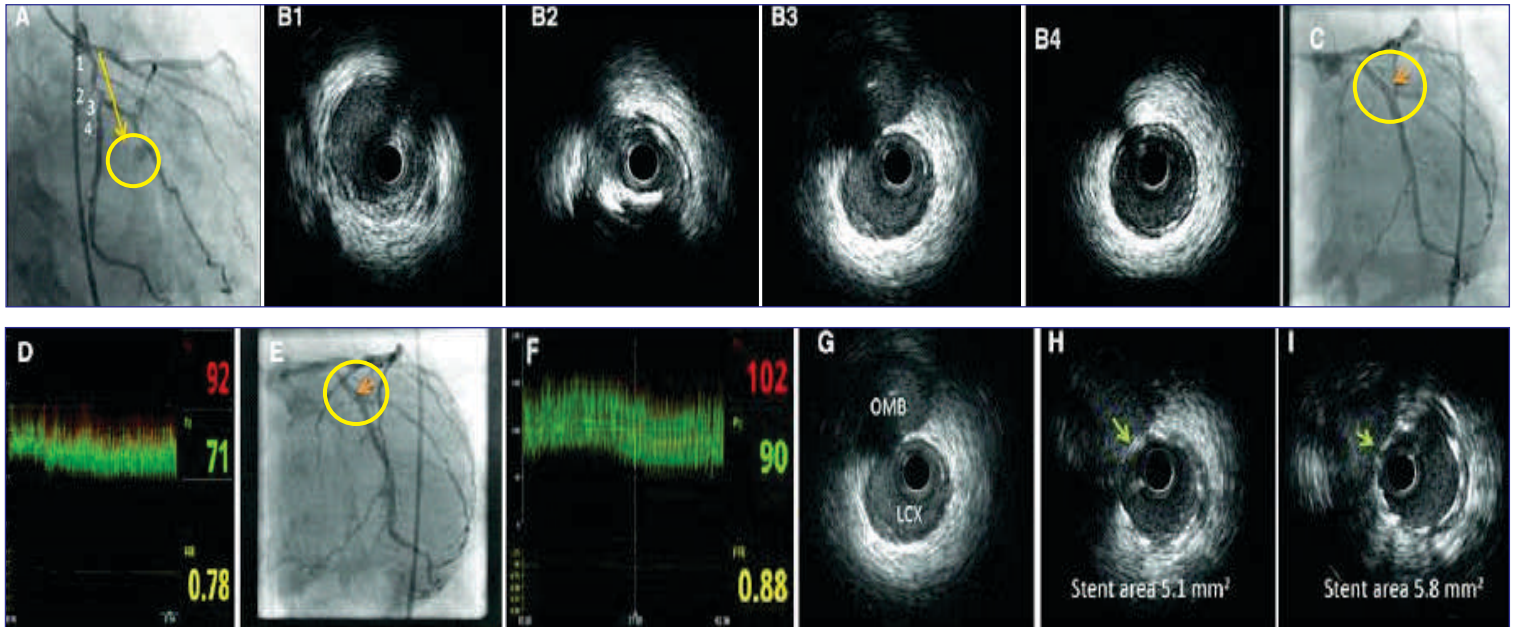
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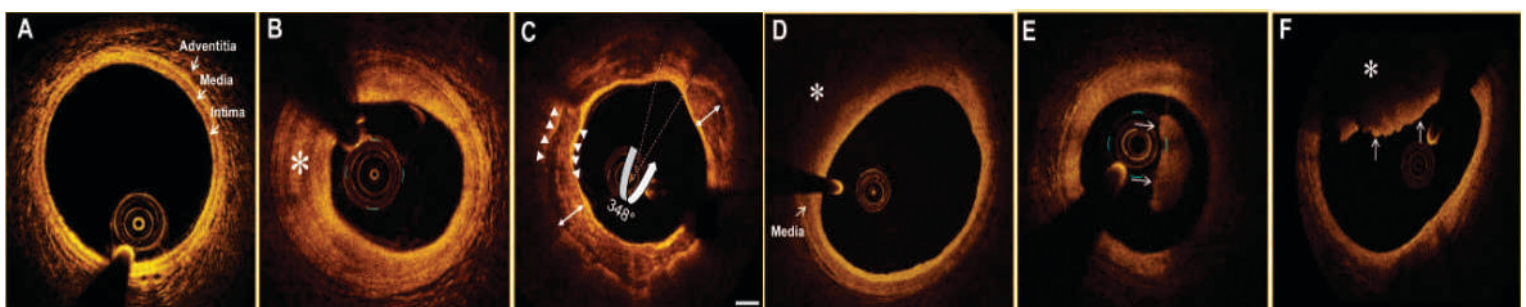




**Fig. 2 - Intra Vascular Ultra Sound Image**

### Following are some advantages: of IVUS imaging:

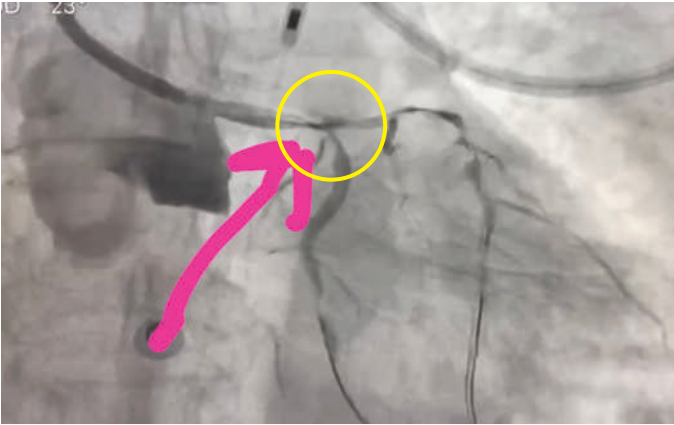
- Three-dimensional view of a coronary artery.
- It gives cross-sectional imaging of the vessels.
- It provides enhanced tissue characterization, which allows detection and quantification of various plaque structure.
- It measures the degree of narrowing of an artery due to plaque.
- It can find the areas of external compression in a vein due to blood clots.
- It can detect the presence and proportion of calcifications, imaging helps identify stent necrotic tissues. or neoangiogenesis, and neovessel formation.
- IVUS imaging is effective in high-risk groups, including patients with diabetes, ACS. and Impaired Renal Function.
- Optimization and management of immediate complications during PCI, such as thrombus, dissection, or tissue. prolapse while surgery.
- With the help of IVUS, the surgeon can assess the risk of myocardial infarction and angiographic no-reflow during surgery.



**Fig. 3 - Optical Coherence Tomography**



## Imaging in High Risk Patient Useful or Not?



### Critical Left Main Artery Narrowing into Origin of both Left Circumflex and Left Anterior Descending

#### History and Physical Examination

A 68 year - Male

Admitted with ACS and Heart Failure

ECHO: LVEF 25%

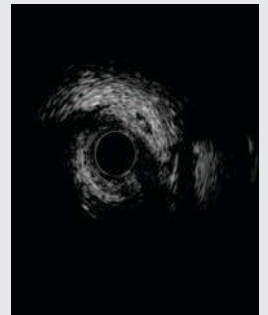
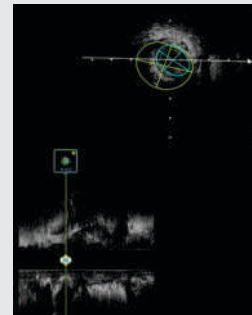
Severe LV Dysfunction

Moderate to Severe MR

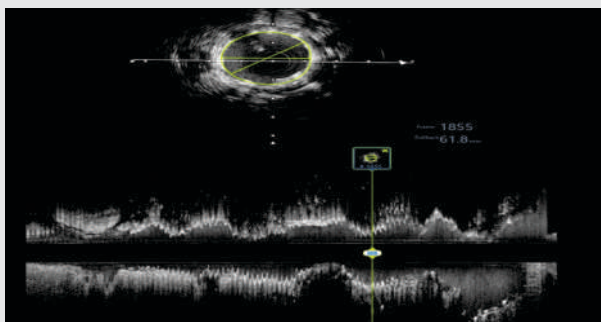
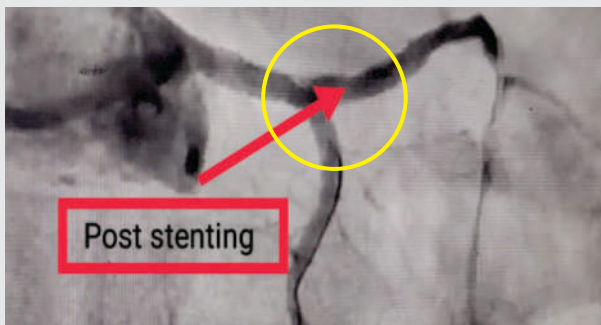
Critical LMCA with Triple Vessel Disease

Admitted for CABG in CIMS /Patient Deferred surgery

High Risk Consent for PCI



### PRE LAD IVUS



### POST LAD IVUS

#### Overview of Procedure

- Successful High risk Complex bifurcation PCI of LM, LAD and LCX with DES under IABP support
- Stented with Mid-Distal LAD with 48mm Stent and Distal LCX with 12mm Stent
- Patient is stable and Recuperating (Initially in SICU)
- IABP Removed
- Hemodynamically stable and Patient discharge

**IVUS:** useful tool to assess vascular geometry, plaque morphology before PCI, useful to assess post PCI tissue prolapse, stent underexpansion/ malaposition

Ivus guided PCI always helps in giving favourable long term outcomes





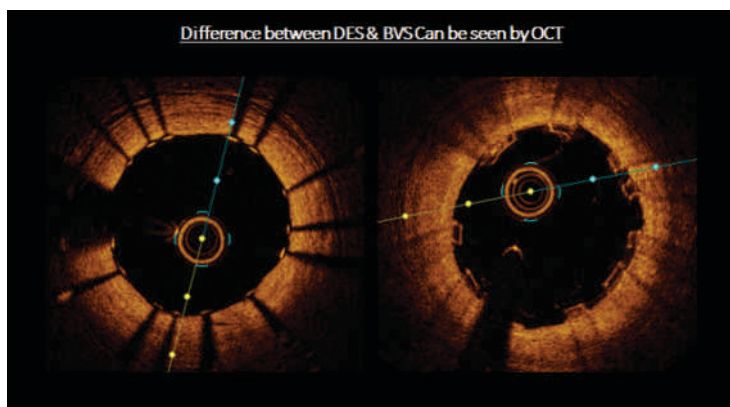
## Novel Invasive OCT Imaging Makes Evaluation Easier & Life Saver

Technological innovations have created a revolution in the health care sector and changed the way how cardiac diseases are viewed and managed across the world.

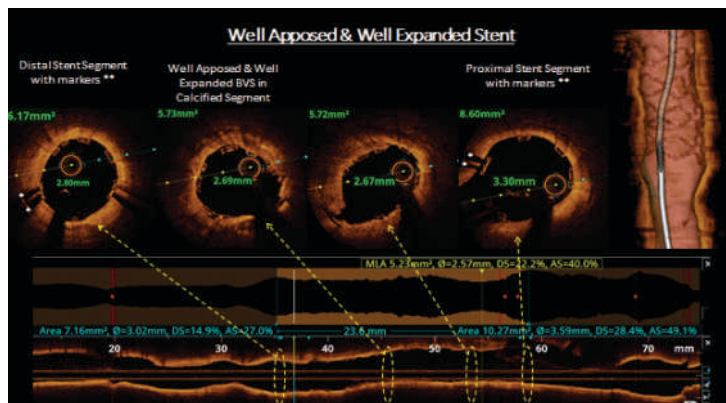
Cardiovascular medicine is undergoing radical changes day by day as a result of the vast number of resources being channeled into the field across the globe. Since the late 1990s, imaging in cardiovascular field has evolved from routine coronary angiography to computerized tomography [CT scan], cardiac magnetic resonance (MRI) and advanced echocardiography. Intravascular coronary imaging techniques like IVUS (intravascular ultrasound) & OCT (optical coherence tomography) has created a revolution in the field of coronary interventions for the betterment of patients.

New and improved intervention techniques are helping save lives and hastening recovery among cardiac patients. Technological advancements have made cardiac care far more effective and accessible to a lot more than it was a decade ago. OCT has improved the chances of recovery for patients with intense coronary blockages...

“What sets us apart is our clinical expertise and our evidence based, multidisciplinary treatment approach which is backed by the latest research and high-end medical technology usage”



“Usage of OCT in Cardiology Department of CIMS Hospital, is also one of the many steps taken to ensure optimal results even in the most complex cases and results in better patient outcomes.”



### What is OCT?

Optical Coherence tomography (OCT) is a type of advanced medical imaging that uses light waves to take near-photographic quality cross-section pictures of living tissues. With OCT, doctors can obtain images of the blood vessels that are about the same as if they were looking under a microscope. The test, which received regulatory approval for cardiac use in India in the last decade, is usually performed as part of angiogram. In interventional cardiology, OCT imaging is used to take detailed images of blood vessel walls. These pictures are used to help determine the extent and burden of atherosclerotic plaques (build-up of cholesterol and other material) in a patient's arteries.

These plaques can build up and cause chest pain called angina. This detailed understanding can help an interventional cardiologists determine whether a stent is needed to treat the blockage and where to best place a stent so as to treat the blockage. After a stent has been placed, OCT can also be used to see how well the stent is covering the plaque and make certain it is expanded to the correct size for your vessel.

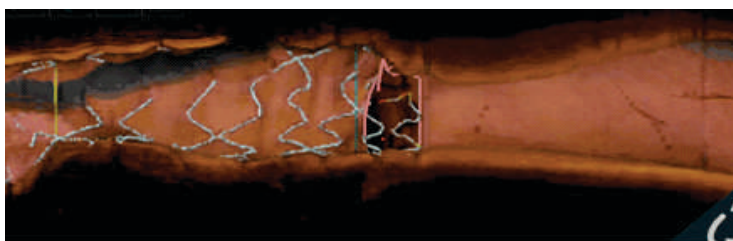
### How does OCT work?

Most of us are already familiar with ultrasound, which uses sound waves to create images of internal structures in the body. OCT works similarly to ultrasound but uses infrared light instead of sound waves. In the case of OCT for cardiovascular procedures, an optical beam is directed at the tissue to be imaged and a small portion of this light that reflects from sub-surface features is collected. These signals are transmitted to a computer program that converts them to images of the blood vessel wall.



## How does OCT benefit patients?

- OCT provides detailed images of superficial coronary plaque components. As per the histological analysis of autopsy specimens, there are 3 general plaque types: Fibrous, Fibro-calcific and Lipid Rich. All these plaque types can be accurately identified by OCT identifies plaque characteristics that predispose to rupture, including the thin fibrous caps, large lipid cores, and accumulation of macrophages.



**Useful 3D Bifurcation Mode to Check Opening of Side Branches**



**Stent only Mode to Confirm Stent Optimization**

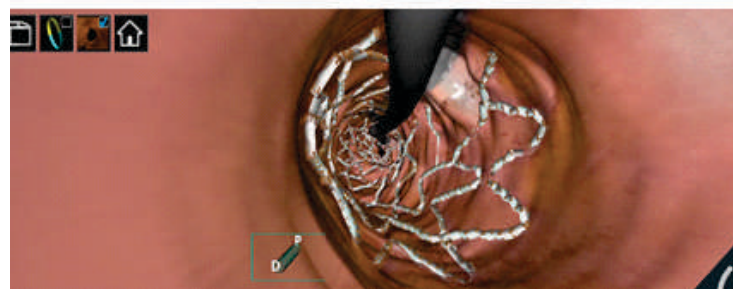
- OCT can provide critical information to guide coronary interventions, in addition to characterizing atherosclerotic plaques.
- OCT can be utilized to measure the reference vessel diameter, minimal luminal diameter, and length of the target lesion.
- OCT can be used to identify stent malapposition, tissue prolapse and both in-stent and edge dissection with higher sensitivity than IVUS.
- It is of specific benefit in assessing stent apposition with overlapping stents.
- It is utilized as a research tool to study coronary artery pathophysiology as well as response to endovascular interventions. In addition, it is also used to compare various stent platforms in terms of deployment, endothelialization and in-stent restenosis.
- OCT gives you real 3D reconstruction, which will be helpful during complex PCI, bifurcation PCI.

## What are the applications of OCT?

The application of OCT in daily clinical practice can help in improving the outcomes for the patients and provide an Optimal Percutaneous coronary Intervention. OCT can help guide physicians on specific clinical situations and can help optimize physician treatment strategies. Some of the day to day practical applications can be as below:

- In-stent Restenosis
- Assessment of Calcified Lesions
- Thrombosis
- Stent Deployment and Edge Dissection
- Bifurcation Lesion Assessment and Percutaneous Coronary Intervention

“The addition of OCT to our imaging devices offers a more comprehensive array of imaging tools, enabling practitioners earlier and more effectively. OCT- guided procedures offer better procedural and in-hospital outcomes, and better long-term survival compared to standard angiography-guided interventional procedures. Increased adoption of OCT imaging, when combined with advanced technology like AI, allows cardiologists to have a more precise and measurable way of supporting patients undergoing coronary stent procedures. It can potentially improve physician systematic process, reducing variability and increasing accuracy of diagnosis and application of therapies”







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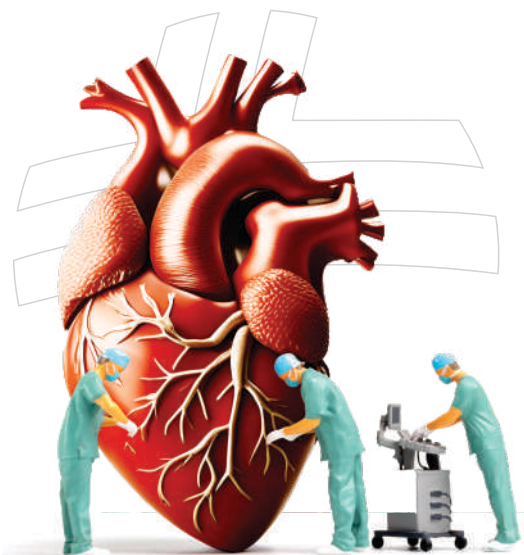
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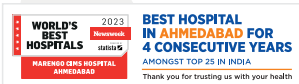
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