

Is Your Lab Using Intravascular Imaging Enough?

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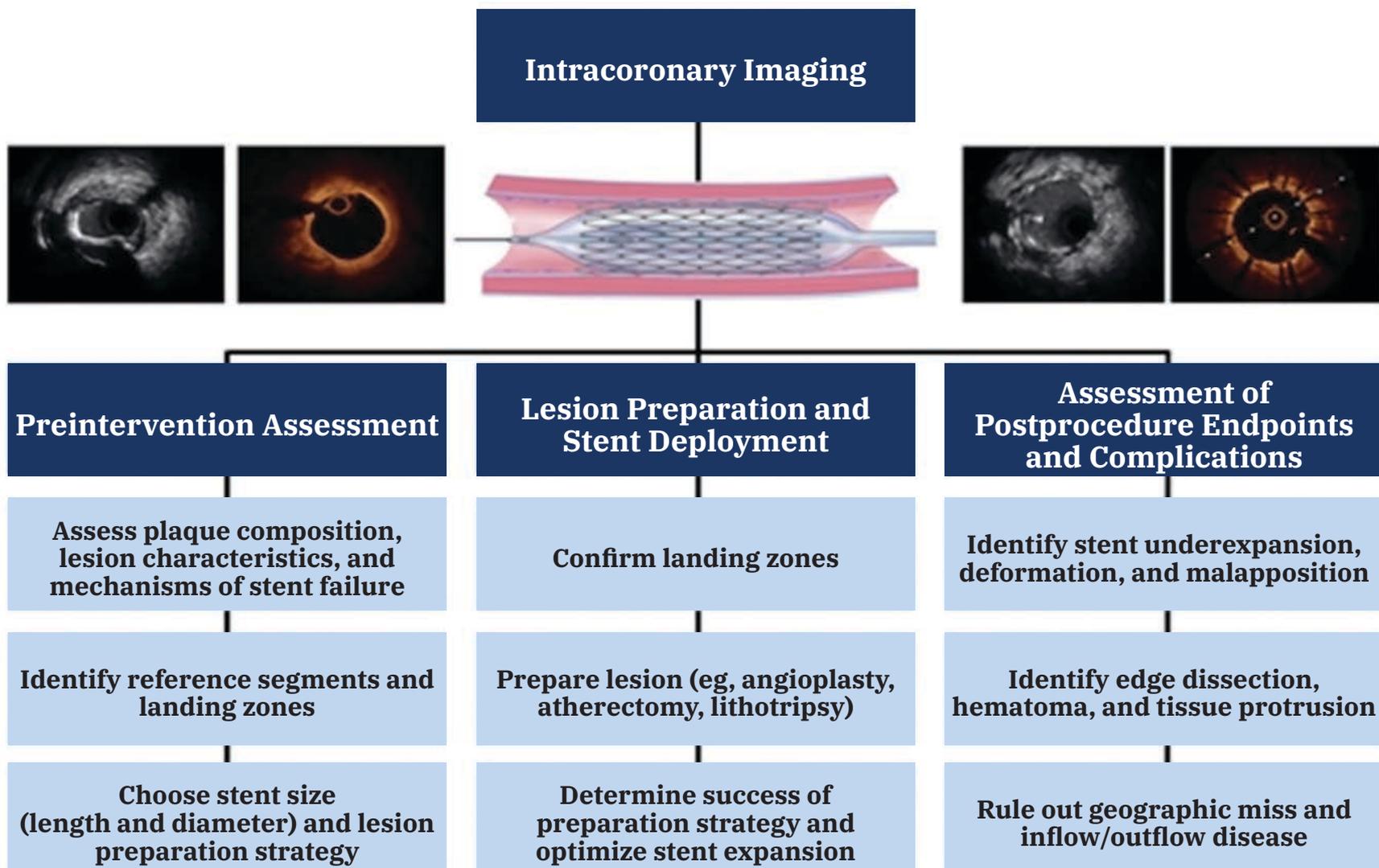
Every percutaneous coronary intervention (PCI) operator should have the skills to treat a wide variety of coronary stenosis using an impressive array of devices and techniques. Good practice says that every implanted stent should be optimized, ie, well-expanded and well-apposed to the vessel wall to ensure the best clinical results with the lowest rates of restenosis and acute or late thrombosis.¹ The scientific literature is packed with data on why intravascular imaging should be routine for PCI, both before and after stent placement (Figure). However, the discordance between the evidence and guidelines with the actual use of imaging across the country and around the world demonstrates that not all operators practice PCI with imaging. Over the years I am still confounded by the disparity between Japan and the United States.² Japan has a rate of >90% routine intravascular ultrasound (IVUS) use during

PCI. In comparison, Bergmark et al³ reported that in a real-world U.S. Medicare population of 502,821 PCI procedures, 463,201 (92%) were guided by angiography alone, with IVUS or optical coherence tomography (OCT) used in only 37,908 (7.5%) and 1712 (0.3%), respectively. Notably, compared with angiography alone, the risk of myocardial infarction (MI) or repeat revascularization was lower with OCT and the risk of MI alone was lower with IVUS. In a real-world U.S. cohort, IVUS and OCT were used infrequently during PCI. It's an old question but still relevant today: "Why does IVUS use during PCI remain so low in the U.S.?"

As a strong proponent of both imaging and physiology to guide PCI, I was stimulated to ask this question again after reading the recent RENOVATE-COMPLEX-PCI study by Lee, Choi, and Song, et al⁴ published in the *NEJM*. The RENOVATE-COMPLEX-PCI study

looked at the outcomes of intravascular image (IVUS/OCT)-guided PCI compared to angiography for complex PCI in one center in South Korea. Patients (n=1639) were randomized to intravascular imaging-guided or standard angiography-guided PCI. At 2 years, 76 (8%) patients in the intravascular imaging group (n=1092) and 60 (12%) patients in the angiographic group (n=547) experienced major adverse events. Death was 1.7% in the IVUS group and 3.8% in the angiographic group, with target vessel revascularization and myocardial infarction higher in the angiographic group. This well-done study of PCI using intravascular imaging compared to angiography alone, much like the FAME 1 trial with fractional flow reserve (FFR) versus angiography alone, found that with image-guided PCI, patients with complex coronary artery disease had a lower risk of major adverse cardiac events, including death.

The RENOVATE-COMPLEX-PCI study takes its place among many others indicating the use of intravascular imaging provides superior PCI outcomes. Why, then, do some U.S. operators avoid using imaging for routine practice? I thought I'd look again at this question, as it has been asked for decades since the introduction of imaging



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Despite attempts to overcome the barriers, IVUS/OCT is still widely underutilized.

(the same can be said about physiology). To be clear, the data on imaging for PCI are currently overwhelmingly favorable. The 2022 Society for Cardiovascular Angiography and Interventions/American College of Cardiology/American Heart Association (SCAI/ACC/AHA) consensus on best PCI practices recommends that intravascular imaging be incorporated into every PCI performed.¹

Variations in the Use of IVUS

The use of IVUS during PCI can vary between regions in countries³ and between countries² for several reasons:

- 1. Reimbursement:** While it is approved for the use of IVUS systems for specific indications, reimbursement may be limited for certain cases. Higher reimbursement favors higher use.
- 2. Cost:** The cost of IVUS systems with their disposable catheters influences use in some parts of the world. High costs, lower use. Countries with smaller healthcare budgets prioritize cost-effective alternatives or reserve IVUS for specific cases.
- 3. Clinical guidelines:** Issued by professional societies, guidelines and consensus statements often influence the practice of PCI, providing evidence for or against certain procedures/techniques. Strong recommendations should produce high use rates.
- 4. Physician training and the practice environment:** By now, every interventional cardiologist is familiar with IVUS/OCT and the data around the benefits of imaging. Operators from programs that routinely employ IVUS/OCT produce new interventionalists who often adopt this practice. However, an opposing force impacting the new graduates' use of IVUS is the milieu or habits of the trainee's new physician group. A negative attitude toward IVUS from either colleagues or lab staff can reduce utilization as well.
- 5. Technical complexity and procedure time:** IVUS/OCT requires specialized knowledge and skill to perform and interpret the imaging accurately. Both the staff and the operator must become trained and comfortable with the imaging workflow. The labs with dedicated personnel interested and active in imaging data acquisition are among the highest users.

Any adjunctive technique to PCI adds time. The operators often weigh the value of the information against the additional time (ie, delay to the next case), a particular concern in busy catheterization laboratories. While admirable for economics, the

goal of minimizing procedural time and maximizing patient throughput should never override good clinical practice. No one thinks about extra time when managing a difficult lesion or a complication. Nonetheless, some operators eschew IVUS because of extra time in a routine use of IVUS.

Guideline Recommendations for Intravascular Imaging

Despite attempts to overcome the barriers with a combination of educational efforts, supportive reimbursement policies, improved IVUS technology and imaging analysis, and the development of clear clinical guidelines that promote its appropriate use, IVUS/OCT is still widely underutilized. In several clinical scenarios identified in both the ACC/AHA guidelines⁴ and European Society of Cardiology (ESC) guidelines,⁵ intravascular imaging is strongly recommended for the routine use of IVUS, specifically:

- a. Complex lesions:** IVUS is considered reasonable for assessing lesion characteristics, optimizing stent size and length, and evaluating stent expansion in complex coronary lesions.
- b. Left main coronary artery disease:** IVUS is reasonable for guiding stent size, length, and optimization in left main coronary artery stenting.
- c. Chronic total occlusions (CTOs):** IVUS can be useful for assessing CTOs, guiding wire crossing, and optimizing stent placement.
- d. Stent failure:** IVUS can be considered for evaluating stent failure or restenosis and determining the need for repeat intervention.
- e. Unclear angiographic assessment:** IVUS can be considered to assess the severity of intermediate lesions, evaluate ambiguous or discordant angiographic findings, and guide decision-making in equivocal cases.

The Bottom Line

Although many operators and labs know what IVUS/OCT can do and how to use it, many still do not practice or accept the recommendations for use. My suggestions for using imaging and physiology to achieve best practices in the cath lab include the following:

- To give your patient the best chance sustained clinical benefit from PCI, operators should use IVUS and not be dissuaded by low reimbursement. We should do the right thing regardless of pay.
- There should be no excuse that the lab/operator is unfamiliar (ie, not trained) with imaging/physiology. Training is readily available from the companies and at every interventional cardiology meeting (especially at the annual SCAI Scientific Sessions).
- Time should not be an excuse to shirk on best practices. The few minutes of extra time is well worth the clinical long-term gains.
- Operators and labs should recognize and accept the guidelines and consensus state-

ments from our colleagues and professional societies. A lot of brainpower went into these documents to help us help our patients.

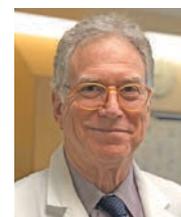
While I understand the reticence to routinely using IVUS or FFR (believe it or not, I too feel this now and again), let's all work to practice the best modern PCI we can. ■

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