Benefits of intravascular imaging for percutaneous coronary intervention in acute coronary syndromes with complex lesions

Challenges with angiography-guided PCI

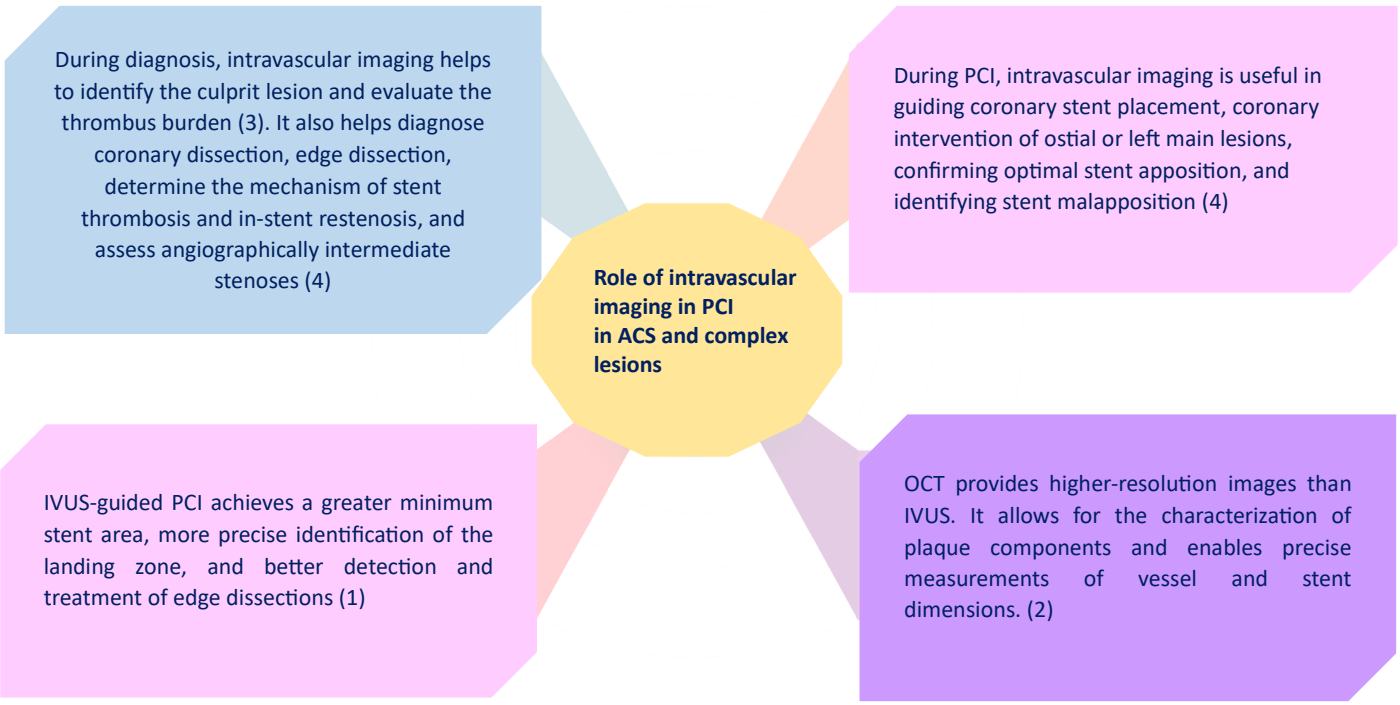
Angiography has a low resolution and cannot provide insight beyond the coronary artery lumen (1)

Angiographic visualization of complex anatomies is often hampered by obscurity and this can affect the critical steps of stent implantation (2)

How intravascular imaging such as IVUS or OCT overcomes the angiography challenges in PCI

Intravascular imaging facilitates precise lesion assessments, selection of the adequate stent length, size, and implantation site, and evaluation of stent expansion, vessel wall apposition, and lesion coverage (1), (3). This reduces the risk of repeat revascularization, stent thrombosis, and myocardial infarction (3)

OCT has greater image resolution than IVUS, and a good depth of tissue penetration in calcified lesions (2).



ACS, acute coronary syndrome; IVUS, Intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention

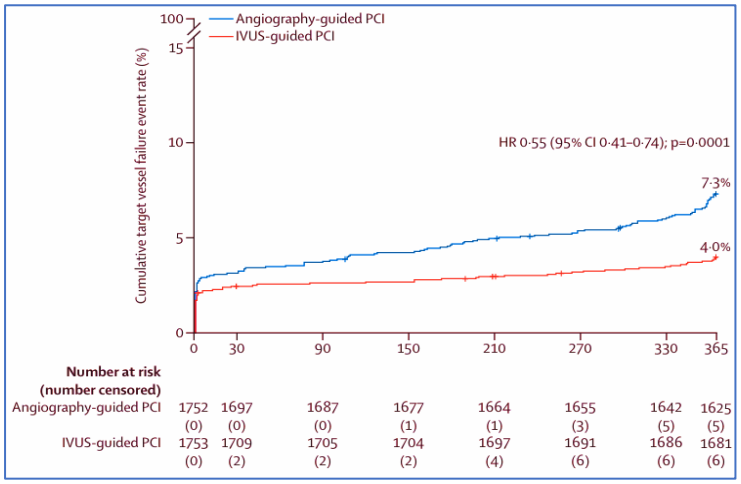
Two recent studies compared the outcomes of intravascular imaging vs angiography-guided PCI in acute coronary syndromes (IVUS-ACS trial) and complex bifurcation lesions (OCTOBER Trial)

IVUS-ACS trial (IVUS vs angiography) (1)	OCTOBER trial (OCT vs angiography) (2)
Randomized, double-blind	**Randomized, open-label**
58 countries	**38 centers**
3505 patients; mean age 62 years	**1201 patients; mean age 66.3 years**
Patients with an acute coronary syndrome (including unstable angina, non-ST-segment elevation myocardial infarction, and ST-segment elevation myocardial infarction) caused by a culprit lesion in an untreated coronary artery segment	Patients with stable angina, unstable angina, or a non-ST-segment-elevation myocardial infarction (>72 hrs ago). Complex coronary artery bifurcation lesion seen on angiography. Main branch reference diameter of at least 2.75 mm and stenosis of at least 50% by visual estimation. Side branch reference diameter of at least 2.5 mm and stenosis of at least 50% within 5 mm from the ostium of the side branch by visual estimation
Random allocation in 1:1 ratio to IVUS-guided or angiography-guided PCI	**Randomization in a 1:1 ratio to undergo OCT-guided PCI or angiography-guided PCI**
Criteria for optimal stent implantation **Non-left main lesions:** • minimal stent area > 5 mm² or >90% of the minimal lumen area at the distal reference segment • plaque burden <55% within 5 mm proximal or distal to the stent edge • absence of medial dissection > 3 mm in length **Left main lesions:** • minimal stent area > 10 mm² • > 7 mm² for the ostial or proximal left anterior descending artery • > 6 mm² for the ostial or proximal left circumflex artery (if stented)	**Criteria for optimal stent implantation** • Optimal coverage: 5-mm edge zones adjacent to the stent having stenosis NOT > 30% of the reference diameter, no major lipid plaque or plaque rupture, and no edge dissection that visible on angiography • Optimal stent expansion: residual diameter stenosis < 10% and <50% diameter stenosis in the ostium of the side branch when a stent was implanted in the main branch only • Absence of stent malapposition: entire stent having contact with the vessel wall • Stents not accidentally crushed or distorted

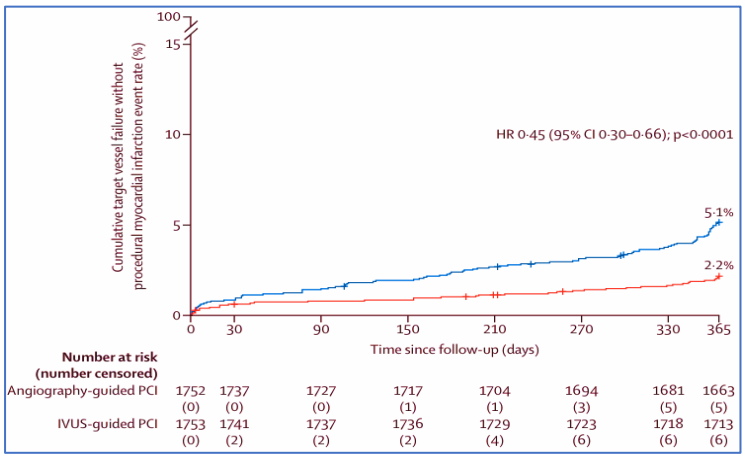
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Key outcomes

IVUS-ACS trial (IVUS vs angiography) (1)



The primary endpoint was target vessel failure, defined as the composite of death from cardiac causes, target vessel myocardial infarction, or clinically driven target vessel revascularization at 1 year of follow-up. It occurred in 70 patients in the IVUS group and in 128 patients in the angiography group



The risk of target vessel failure without procedural myocardial infarction was also lower in the IVUS group than in the angiography group.

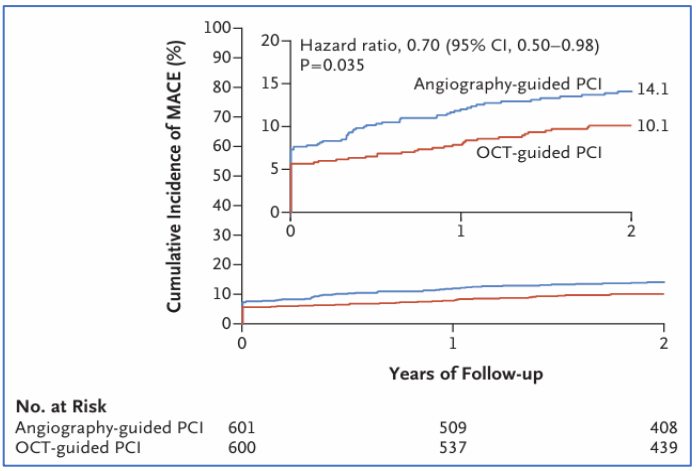
In the IVUS group, optimal post-intervention IVUS criteria were met in 79·9% of patients.

The superior outcomes in the IVUS group were due to the implantation of larger and longer stents at higher pressures (which results in the achievement of a greater minimum stent area); more precise identification of the landing zone (which minimizes undertreatment of the reference segment disease); and better detection and treatment of edge dissections

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OCTOBER trial (OCT vs angiography) (2)

MACE (major adverse cardiovascular events) occurred in 10.1% of patients in to OCT-guided PCI group and in 14.1% of patients in the angiography guided PCI group (P = 0.035)



Secondary endpoints

	OCT-Guided PCI (N = 600)	Angiography-Guided PCI (N = 601)	Hazard Ratio (95% CI)
	events (estimated percentage)		
Patient-oriented composite end point‡	79 (13.6)	103 (17.7)	0.76 (0.56–1.01)
Death from any cause	13 (2.4)	23 (4.0)	0.56 (0.28–1.10)
Death from a cardiac cause	8 (1.4)	15 (2.6)	0.53 (0.22–1.25)
Target-lesion myocardial infarction	46 (7.8)	51 (8.5)	0.90 (0.60–1.34)
Ischemia-driven TLR	16 (2.8)	26 (4.6)	0.61 (0.32–1.13)
Stent thrombosis	12 (2.1)	17 (3.0)	0.70 (0.34–1.47)
Definite	3 (0.5)	4 (0.7)	0.75 (0.17–3.34)
Probable	2 (0.3)	1 (0.2)	1.99 (0.18–22.0)
Possible	7 (1.3)	12 (2.1)	0.58 (0.23–1.47)

‡ The patient-oriented composite end point is a composite of death from any cause, any myocardial infarction, any revascularization, or stroke. TLR, target-lesion revascularization

The outcomes of IVUS-ACS and OCTOBER trial show that in patients with an acute coronary syndrome and those with complex coronary-artery bifurcation lesions intravascular imaging-guided PCI is associated with a lower incidence of MACE compared to angiography-guided PCI

Points for Discussion

1. Currently, in what % of PCIs do you use intra-coronary imaging?
2. In a hypothetical world where there is no cost / economic barrier, what % of PCIs would you do with some form of intracoronary imaging?
3. What are your views on the following statement: *While it is not practically possible to use intracoronary imaging for every PCI, ensuring a Brilinta protection to 100% PCI patients provides the best chance to a majority of patients in India.*

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References:

(1) Li X, Ge Z, Kan J, et al. Intravascular ultrasound-guided versus angiography-guided percutaneous coronary intervention in acute coronary syndromes (IVUS-ACS): a two-stage, multicentre, randomised trial. *Lancet*. 2024;403(10439):1855-1865. doi:10.1016/S0140-6736(24)00282-4.

(2) Holm NR, Andreasen LN, Neghabat O, et al. OCT or Angiography Guidance for PCI in Complex Bifurcation Lesions. *N Engl J Med*. 2023;389(16):1477-1487. doi:10.1056/NEJMoa2307770.

(3) den Dekker WK. Is intravascular imaging the future of percutaneous coronary intervention? *Lancet*. 2024;403(10439):1822-1823. doi:10.1016/S0140-6736(24)00430-6.

(4) Smilowitz NR, Mohananey D, Razzouk L, Weisz G, Slater JN. Impact and trends of intravascular imaging in diagnostic coronary angiography and percutaneous coronary intervention in inpatients in the United States. *Catheter Cardiovasc Interv*. 2018;92(6):E410-E415.