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EDITORIAL

Adopting an intravascular imaging-guided management strategy for patients presenting with acute coronary syndrome: from understanding the mechanism to treatment optimisation

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Japan is uniquely positioned in contemporary percutaneous coronary intervention (PCI); few countries have integrated intravascular imaging (IVI) into routine practice as consistently – or as broadly across clinical presentations – as Japan. The "near-default" use of intravascular ultrasound (IVUS) and the growing penetration of optical coherence tomography (OCT) create an opportunity to study imaging guidance when it is woven into routine PCI decision-making.

In this issue of EuroIntervention, Takegawa and colleagues used the National Database of Health Insurance Claims and Specific Health Checkups of Japan – an administrative dataset with anonymised patient-level information on diagnoses, procedures, prescriptions, and medical devices across inpatient and outpatient care – to evaluate the association between IVI-guided PCI and outcomes in patients presenting with acute coronary syndrome (ACS), approximately two-thirds of whom had acute myocardial infarction (AMI)[1]. A patient-matching approach enabled the long-term follow-up of more than 90% of patients.

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Between April 2014 and March 2021, 492,303 ACS patients underwent their first PCI. Over that period, OCT-guided PCI increased from 4.7% to 6.9%, IVUS-guided PCI increased from 77.0% to 87.9%, and angiography-guided PCI alone decreased from 17.0% to 4.8%. Median follow-up was 1,113 days. The primary outcome – ACS recurrence after discharge – was lower with IVI-guided PCI compared with angiography-guided PCI (hazard ratio [HR] 0.76, 95% confidence interval [CI]: 0.70-0.82; p<0.001). A key secondary outcome – the composite of all-cause death and ACS recurrence – was also lower with IVI guidance (HR 0.85, 95% CI: 0.82-0.89; p<0.001). These findings were consistent when IVUS and OCT guidance were analysed separately. Because Japan represents an environment in which the adoption of IVI is high, these data raise an immediate question of generalisability to regions where IVI is used selectively.

A useful contrast comes from the British Cardiovascular Intervention Society (BCIS) registry. Among 598,921 patients undergoing PCI for ACS (60% non-ST-segment elevation myocardial infarction [NSTEMI] and 40% ST-segment elevation myocardial infarction [STEMI]); from 2006 to 2019, 41,716 (7.0%) procedures used IVI, increasing from 1.4% in 2006 to 13.5% in 2019[2]. Within the IVI group, 5.6% used IVUS and 1.4% used OCT. Compared with angiography-guided PCI, IVI use was associated with lower odds of in-hospital mortality (1.7% vs 2.4%; p<0.001) and lower odds of in-hospital major adverse cardiovascular and cerebrovascular events (3.3% vs 3.8%; p<0.001), particularly in patients undergoing left main and left main/left anterior descending PCI. (Of note, a presentation of the most recent BCIS data[3] reported that IVI use in ACS patients increased to 28% in 2025.)

In Japan, angiography guidance alone was more common in elderly patients, females, patients with comorbidities, and AMI patients. In the United Kingdom, IVI guidance was used more commonly in younger patients; in patients with left ventricular dysfunction, prior AMI, prior PCI, comorbidities (diabetes mellitus, hypertension, kidney disease, peripheral

vascular disease, and cerebrovascular disease); and in patients with in-stent restenosis and increased disease complexity. In other words, "who gets IVI" reflects a local mix of reimbursement, training culture, workflow, and perceived incremental value, thus making patient selection and confounding central interpretive issues important in registry comparisons. Importantly, an additional layer of confounding is physician-level variability; the differences in operator preference, experience, threshold to image, and image interpretation/optimisation standards are difficult to measure – and even harder to fully adjust for – in administrative and procedural registries.

One practical question in ACS is not whether IVUS or OCT guidance is "better", but which modality best answers the clinical question in front of the operator and in which patients is IVI most likely to change management. In the OPINION ACS randomised trial and in the Korean Acute Myocardial Infarction Registry (KAMIR), there was no significant difference in clinical outcomes between IVUS and OCT guidance[4,5]. The one subgroup in which IVI guidance did not improve outcomes was cardiogenic shock[6]. OCT offers higher axial resolution, enabling detailed assessment of fibrous cap disruption and superficial plaque erosion – at the cost of additional contrast and potential limitations in heavy thrombus. IVUS provides deeper penetration, assessment of vessel size and remodelling, with fewer contrast constraints – at the cost of lower resolution for some superficial features. In ACS, the modality should match the clinical problem.

ACS registries rarely capture ACS mechanisms – precisely where IVI may deliver its most distinctive clinical value. A thin-cap fibroatheroma is present in 95% of cases of plaque rupture, and plaque rupture accounts for approximately half of ACS events. Fibrous lesions may cause acute thrombosis due to plaque erosion, accounting for 30-40% of ACS events, a proportion that appears to be increasing in the context of contemporary preventive therapy, mirroring an increasing prevalence of NSTEMI versus STEMI; and 50% of NSTEMI have either no angiographic culprit or multiple potential culprits[7]. Eruptive calcified nodules cause 5% of acute events, a prevalence that may also be increasing as the patient population ages. The mechanism matters because it plausibly both modifies the need for stenting and adds prognostic information. Eruptive calcified nodules have the highest rate of post-PCI events, while plaque erosion has the lowest rate of post-PCI events[8].

This principle was illustrated by the OCT-based EROSION studies. In the proof-of-concept EROSION I study, a strategy of a purely antithrombotic treatment without PCI was associated with a major adverse cardiovascular events (MACE) rate of 7.5% at 1 year[9]. This was followed by the EROSION III multicentre randomised trial in which 246 STEMI patients were randomised to OCT or angiography guidance. In the OCT-guided arm, two-thirds of patients had underlying plaque rupture, whilst one-quarter had plaque erosion[10]. OCT guidance was associated with less stent implantation (43.8% vs 58.8%; p=0.024) and equal MACE at 1 year (1.8% vs 2.6%; p=0.67) compared with an angiography-guided PCI. ACS can also be caused by spontaneous coronary dissection or present as non-obstructive disease (myocardial infarction with non-obstructive coronary artery disease [MINOCA]). In MINOCA, outcomes are worse if the non-obstructive disease has an underlying atherosclerotic morphology[11]. Angiography alone often cannot reliably define the culprit mechanism or even the culprit lesion, which can result in inappropriate PCI in both MINOCA patients and NSTEMI patients.

Even when thoughtfully designed, registries cannot account for the impact of these morphological differences. Randomised trials, therefore, remain crucial. The ACS-IVUS trial in China randomised 3,505 ACS patients (roughly one-third STEMI, one-third NSTEMI, and one-third unstable angina) to IVUS-guided PCI (n=1,753) versus angiography-guided PCI (n=1,752) between 2019 and 2022[12]. The primary endpoint – target vessel failure (TVF; cardiac death, target vessel myocardial infarction [MI], or clinically driven target vessel revascularisation) at 1 year – occurred in 4.0% in the IVUS group and 7.3% in the angiography group (HR 0.55, 95% CI: 0.41-0.74; p=0.0001), driven by reductions in target vessel MI or target vessel revascularisation across multiple subgroups (ACS types, diabetes status, and biomarker positivity). The ACS-IVUS investigators subsequently developed a TVF-ACS risk score. Approximately 25% of patients were considered high risk, and these patients exhibited a higher 1-year rate of TVF compared with low-risk patients (19.8% vs 5.7%; HR 3.81, 95% CI: 2.06-7.02; p=0.00002). Among 3,486 randomised patients, IVUS guidance compared with angiography guidance reduced 1-year TVF in high-risk patients (6.9% vs 17.6%; HR 0.38, 95% CI: 0.24-0.59) but had a lesser effect in low-risk patients (3.2% vs 4.3%; HR 0.75, 95% CI: 0.51-1.11)[13].

No matter how you look at the problem, IVI guidance should be a central tool in treating patients who present with ACS. It begins by defining culprit morphology and lesion complexity, continues with triage to PCI versus medical therapy, and ends with stent optimisation when PCI is appropriate. The incremental value of imaging in ACS is likely greatest where angiography is most likely to miss the mechanism or underoptimise the result.

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Conflict of interest statement

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References

1. Takegawa K, Kanaoka K, Iwanag Y, Sasano T, Nishioka Y, Myojin T, Noda T, Imamura T, Miyamoto Y. Intravascular imaging-guided percutaneous coronary intervention in patients with acute coronary syndrome. *EuroIntervention*. 2026;22:e292-300.
2. Zaman M, Stevens C, Ludman P, Wijeysundera HC, Siudak Z, Sharp ASP, Kinnaird T, Mohamed MO, Ahmed JM, Rashid M, Mamas MA. Intracoronary imaging in PCI for acute coronary syndrome: Insights from British Cardiovascular Intervention Society registry. *Cardiovasc Revasc Med*. 2023;56:50-6.
3. Mamas MA. National BCIS PCI Audit. BCIS ACI 2026. 28-30 January 2026. London, UK.
4. Otake H, Kubo T, Hibi K, Natsumeda M, Ishida M, Kataoka T, Takaya T, Iwasaki M, Sonoda S, Shinke T, Nakazawa G, Takahashi Y, Ioji T, Akasaka T, Investigators OA. Optical frequency domain imaging-guided versus intravascular ultrasound-guided percutaneous coronary intervention for acute coronary syndromes: the OPINION ACS randomised trial. *EuroIntervention*. 2024;20:e1086-97.
5. Lee OH, Heo SJ, Johnson TW, Kim Y, Cho DK, Kim JS, Kim BK, Choi D, Hong MK, Jang Y, Jeong MH; Investigators for KAMIR. Optical coherence tomography-guided versus intravascular ultrasound-guided percutaneous coronary intervention in patients with acute myocardial infarction. *Rev Esp Cardiol (Engl Ed)*. 2024;77:607-17.
6. Lee OH, Heo SJ, Johnson TW, Kim Y, Cho DK, Kim JS, Kim BK, Choi D, Hong MK, Jang Y, Jeong MH; Investigators for KAMIR. Intravascular ultrasound-guided versus angiography-guided percutaneous coronary intervention for acute myocardial infarction with cardiogenic shock. *Sci Rep*. 2024;14:10028.
7. Kerensky RA, Wade M, Deedwania P, Boden WE, Pepine CJ; Veterans Affairs Non-Q-Wave Infarction Stategies in-Hospital (VANQWISH) Trial Investigators. Revisiting the culprit lesion in non-Q-wave myocardial infarction. Results from the VANQWISH trial angiographic core laboratory. *J Am Coll Cardiol*. 2002;39:1456-63.
8. Kondo S, Mizukami T, Kobayashi N, Wakabayashi K, Mori H, Yamamoto MH, Sambe T, Yasuhara S, Hibi K, Nanasato M, Sugiyama T, Kakuta T, Kondo T, Mitomo S, Nakamura S, Takano M, Yonetsu T, Ashikaga T, Dohi T, Yamamoto H, Kozuma K, Yamashita J, Yamaguchi J, Ohira H, Mitsumata K, Namiki A, Kimura S, Honye J, Kotoku N, Higuma T, Natsumeda M, Ikari Y, Sekimoto T, Matsumoto H, Suzuki H, Otake H, Sugizaki Y, Isomura N, Ochiai M, Suwa S, Shinke T; TACTICS investigators. Diagnosis and Prognostic Value of the Underlying Cause of Acute Coronary Syndrome in Optical Coherence Tomography-Guided Emergency Percutaneous Coronary Intervention. *J Am Heart Assoc*. 2023;12:e030412.
9. Xing L, Yamamoto E, Sugiyama T, Jia H, Ma L, Hu S, Wang C, Zhu Y, Li L, Xu M, Liu H, Bryniarski K, Hou J, Zhang S, Lee H, Yu B, Jang IK. EROSION Study (Effective Anti-Thrombotic Therapy Without Stenting: Intravascular Optical Coherence Tomography-Based Management in Plaque Erosion): A 1-Year Follow-Up Report. *Circ Cardiovasc Interv*. 2017;10:e005860.
10. Jia H, Dai J, He L, Xu Y, Shi Y, Zhao L, Sun Z, Liu Y, Weng Z, Feng X, Zhang D, Chen T, Zhang X, Li L, Xu Y, Wu Y, Yang Y, Wang C, Li L, Li J, Hou J, Liu B, Mintz GS, Yu B. EROSION III: A Multicenter RCT of OCT-Guided Reperfusion in STEMI With Early Infarct Artery Patency. *JACC Cardiovasc Interv*. 2022;15:846-56.
11. Zeng M, Zhao C, Bao X, Liu M, He L, Xu Y, Meng W, Qin Y, Weng Z, Yi B, Zhang D, Wang S, Luo X, Lv Y, Chen X, Sun Q, Feng X, Gao Z, Sun Y, Demuyakor A, Li J, Hu S, Guagliumi G, Mintz GS, Jia H, Yu B. Clinical Characteristics and Prognosis of MINOCA Caused by Atherosclerotic and Nonatherosclerotic Mechanisms Assessed by OCT. *JACC Cardiovasc Imaging*. 2023;16:521-32.
12. Li X, Ge Z, Kan J, Anjum M, Xie P, Chen X, Khan HS, Guo X, Saghir T, Chen J, Gill BUA, Guo N, Sheiban I, Raza A, Wei Y, Chen F, Mintz GS, Zhang JJ, Stone GW, Chen SL; IVUS-ACS Investigators. Intravascular ultrasound-guided versus angiography-guided percutaneous coronary intervention in acute coronary syndromes (IVUS-ACS): a two-stage, multicentre, randomised trial. *Lancet*. 2024;403:1855-65.
13. Kan J, Xi Z, Zhang X, Cai D, Tian N, Li X, Liu Z, Anjum M, Xie P, Chen X, Khan HS, Guo X, Saghir T, Chen J, Gill BUA, Guo N, Sheiban I, Ye F, Zhang J, Chen F, Wei Y, Stone GW, Chen SL. Intravascular ultrasound-guided percutaneous coronary intervention in acute coronary syndrome stratified by the TVF-ACS risk score: the IVUS-ACS trial. *Eur Heart J Open*. 2025;5:oeaf145.