EuroIntervention
2026;22:e292-e300
published online e-edition March 2026
DOI: 10.4244/EIJ-D-25-01092

ORIGINAL RESEARCH

Intravascular imaging-guided percutaneous coronary intervention in patients with acute coronary syndrome

Koki Takegawa[1,2], MD; Koshiro Kanaoka[1]*, MD, PhD; Yoshitaka Iwanaga[1,3], MD, PhD; Tetsuo Sasano[2], MD, PhD; Yuichi Nishioka[4], MD, PhD; Tomoya Myojin[4,5], MD, PhD; Tatsuya Noda[4,6], MD, PhD; Tomoaki Imamura[4], MD, PhD; Yoshihiro Miyamoto[7], MD, PhD

**Corresponding author: Department of Medical and Health Information Management, National Cerebral and Cardiovascular Center, Kishibe-Shimmachi 6-1, Suita, Osaka, 564-8565, Japan. E-mail: kanaokak@ncvc.go.jp*

This paper also includes supplementary data published online at: https://eurointervention.pcronline.com/doi/10.4244/EIJ-D-25-01092

ABSTRACT

BACKGROUND: The recurrences of acute coronary syndrome (ACS) and target vessel failure after percutaneous coronary intervention (PCI) remain clinical concerns. Intravascular imaging, such as optical coherence tomography (OCT) or intravascular ultrasound (IVUS), has demonstrated clinical benefits in patients with stable coronary disease; however, the benefits of its use remains unclear in patients with ACS.

AIMS: This study aimed to investigate the benefit of imaging-guided PCI in patients with ACS on the recurrence of ACS using a nationwide database in Japan.

METHODS: This retrospective observational study used records from the National Database between April 2014 and March 2021. We included patients hospitalised with ACS aged ≥20 years who had undergone first-time PCI and divided them into imaging-guided PCI (OCT or IVUS) and angiography-guided PCI groups. The primary outcome was ACS recurrence during a 3-year follow-up period. We analysed the association between intravascular imaging and the outcome using inverse probability of treatment weighting.

RESULTS: Among the patients with ACS, angiography-guided PCI, OCT-guided PCI, and IVUS-guided PCI were performed in 32,044, 22,748, and 297,944 patients, respectively. During the study period, both OCT- and IVUS-guided PCI rates increased, from 4.7% to 6.9% and from 77.0% to 87.9%, respectively. OCT-guided PCI was associated with a lower risk of ACS recurrence (hazard ratio [HR] 0.81, 95% confidence interval [CI]: 0.71-0.91; p<0.001); IVUS-guided PCI was also associated with a lower risk of ACS recurrence (HR 0.76, 95% CI: 0.71-0.82; p<0.001).

CONCLUSIONS: In real-world clinical practice, the rates of both OCT- and IVUS-guided PCI have increased and have been associated with a lower risk of ACS recurrence compared with angiography-guided PCI in patients with ACS.

KEYWORDS: acute coronary syndrome; intravascular ultrasound; optical coherence tomography; percutaneous coronary intervention

SUBMITTED ON 08/10/2025 - REVISION RECEIVED ON 1st 24/11/2025 / 2nd 10/12/2025 - ACCEPTED ON 05/01/2026

Percutaneous coronary intervention (PCI) for patients with acute coronary syndrome (ACS) is now widely performed and has reduced acute-phase mortality. However, recurrent ACS and target vessel failure remain clinical concerns. A previous study reported that approximately 7% of ACS patients developed target vessel failure within 1 year[1]. These chronic-phase coronary events frequently occur in patients with complex lesions, including culprit lesions with residual lipid-rich plaque, bifurcation lesions, and heavily calcified lesions[2-4].

Intravascular imaging, including optical coherence tomography (OCT) and intravascular ultrasound (IVUS), has emerged as an effective modality to enhance culprit lesion assessment and procedural accuracy. Imaging-guided PCI improves lesion characterisation; enables precise stent landing, sizing, and implantation; and helps detect complications such as malapposition or edge dissection that are often missed with angiography guidance alone[5-8]. The use of intravascular imaging in patients with chronic coronary syndrome is a Class 1 recommendation for the assessment of procedural risks and postprocedural outcomes, and has been associated with improved procedure results, including stent underexpansion and a lower occurrence of unplanned PCI[9-17].

Following the guideline recommendations for chronic coronary syndrome, the use of intravascular imaging in patients with ACS with complex lesions became a Class 1 recommendation in the current, updated guidelines[1]. A recent large-scale randomised controlled trial (RCT) reported that IVUS-guided PCI for ACS reduced target vessel failure compared with angiography-guided PCI[1]. However, generalisable evidence supporting both IVUS- and OCT-guided PCI in real-world settings remains limited. Notably, evidence regarding OCT-guided PCI in patients with ACS is limited[18-22].

Therefore, we aimed to investigate the association of OCT- and IVUS-guided PCI in ACS patients with recurrence of ACS using the nationwide administrative database in Japan.

Editorial, see page e271

Impact on daily practice

Intravascular imaging (optical coherence tomography [OCT] and intravascular ultrasound [IVUS]) during percutaneous coronary intervention (PCI) provides detailed lesion assessment and stent optimisation, and, in this nationwide analysis, was associated with lower acute coronary syndrome (ACS) recurrence compared with angiography guidance. The integration of imaging guidance into PCI practice can improve procedural safety by identifying stent malapposition, underexpansion, and periprocedural complications, thereby enhancing long-term clinical outcomes in patients with ACS. Further randomised trials specifically targeting ACS populations are needed to validate the long-term benefit of OCT- and IVUS-guided PCI and to inform global guideline recommendations.

Methods

STUDY DESIGN AND DATABASE

This retrospective, observational study analysed data from the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB) spanning from April 2014 to March 2021. The NDB provides anonymised individual-level data on diagnoses, procedures, prescriptions, and medical devices in both inpatient and outpatient settings. It does not include laboratory results. A patient-matching approach allows long-term follow-up, enabling the tracking of over 90% of patients[23]. Coding details are provided in **Supplementary Table 1**.

STUDY POPULATION

We extracted data on patients aged 20 years or older who had a first-time ACS and underwent PCI. We excluded patients who (1) had no insurance data for >365 days before hospitalisation, (2) died or developed ACS after PCI during hospitalisation, (3) were hospitalised for more than 30 days, (4) required mechanical circulatory support, (5) developed ventricular fibrillation or cardiopulmonary arrest, or (6) underwent coronary artery bypass grafting during hospitalisation. We collected data on patient age, sex, comorbidities, medical history, prescriptions before and during hospitalisation, fiscal year, emergency admission, and PCI procedure. Medications before admission were defined as prescriptions recorded within a period of 90 days prior to first-time PCI. Comorbidities and medical histories were identified by reviewing diagnoses from the 365 days before hospitalisation. Patients were divided into two groups according to whether the index PCI was performed with or without intravascular imaging: an imaging-guided PCI (OCT- or IVUS-guided PCI) group and an angiography-guided PCI group **(Supplementary Figure 1)**.

OUTCOMES

The primary outcome was ACS recurrence after discharge, and the secondary outcome was a composite of all-cause death and ACS recurrence. The results were analysed over a 3-year follow-up period. Event-free censoring was based on the occurrence of the last medical claim during the study period.

STATISTICAL ANALYSIS

The patients' baseline clinical and procedural characteristics are reported as numerical values and percentages for categorical variables. We described the annual changes in the utilisation rate of intravascular imaging. We set up two comparisons: (i) the imaging-guided PCI group versus the angiography-guided PCI group, and (ii) the OCT- and IVUS-guided PCI groups versus the angiography-guided PCI

Abbreviations

ACS	acute coronary syndrome
IPTW	inverse probability of treatment weighting
IVUS	intravascular ultrasound
OCT	optical coherence tomography
PCI	percutaneous coronary intervention

group. We generated a Kaplan-Meier curve and performed a univariable Cox regression analysis to compare the imaging-guided PCI group (the OCT- and IVUS-guided PCI groups) with the angiography-guided PCI group. Inverse probability of treatment weighting (IPTW) was performed using propensity scores with a logistic regression model that included baseline covariates. The balance between groups after weighting was evaluated using absolute standardised mean differences, with values ≤0.1 considered negligible. Hazard ratios (HRs) were calculated using the angiography-guided PCI group as a reference. Statistical significance was set at p<0.05.

Subgroup analyses of the primary outcome were conducted based on age, sex, diabetes mellitus, peripheral vascular disease, and acute myocardial infarction, using multivariable Cox proportional hazards models.

Sensitivity analyses were conducted to assess the effects of the alternative statistical methods and study definitions. First, a multivariable Cox regression analysis was performed, based on the same covariates, to conduct a complementary analysis comparing the groups. Second, propensity score matching was performed using a multivariable Cox proportional hazards model. A calliper width of 0.1 times the standard deviation of the logit of the propensity score and 1:1 nearest-neighbour matching without replacement were used. Third, the analysis was focused on patients with drug-eluting stent (DES) implantation to reflect the inclusion criteria of previous RCTs, and IPTW was performed for the primary and secondary outcomes based on the same covariates. Fourth, to assess effects by index year, the cumulative incidence of ACS recurrence and the absolute risk difference were reported for 2014-2018, with complete 3-year follow-up. Finally, we performed IPTW using hip fracture as a negative control outcome. The data were analysed using Stata version 17 (StataCorp).

Results

STUDY POPULATION AND BASELINE CHARACTERISTICS

A total of 492,303 patients with ACS who underwent their first PCI procedure between April 2014 and March 2021 were identified **(Figure 1, Central illustration)**. The annual changes in the utilisation rate of intravascular imaging are shown in **Figure 2**. During the study period, OCT-guided PCI increased from 4.7% to 6.9%, and IVUS-guided PCI increased from 77.0% to 87.9%, while angiography-guided PCI without the use of intravascular imaging decreased from 17.0% to 4.8%. From the total number of screened patients, 355,811 met the eligibility criteria and were included in the study. Among the participants, 85,960 (24.2%) were aged 60-69 years, 111,396 (31.3%) were aged 70-79 years, and 86,866 (24.4%) were female. The patients were divided into the imaging-guided PCI group (OCT-guided: 22,748 patients; IVUS-guided: 297,944 patients) and the angiography-guided PCI group (32,044 patients). The baseline characteristics according to the groups are shown in **Table 1** and **Supplementary Table 2**. The imaging-guided PCI group had a higher proportion of patients with unstable angina, DES implantation, and procedures in more recent fiscal years, while the angiography-guided PCI group had higher proportions of elderly patients, females, comorbidities, a past medical history, acute myocardial infarction, and procedures performed in earlier fiscal years.

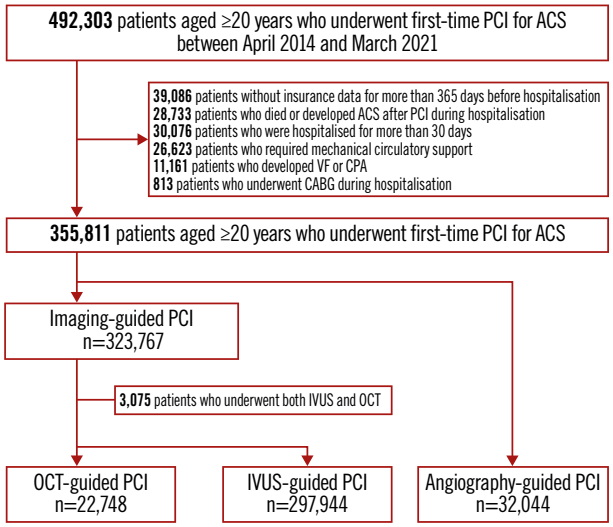


Figure 1. *Flowchart of patient selection. A total of 492,303 patients who underwent first-time PCI for ACS and were discharged alive were screened. ACS: acute coronary syndrome; CABG: coronary artery bypass grafting; CPA: cardiopulmonary arrest; IVUS: intravascular ultrasound; OCT: optical coherence tomography; PCI: percutaneous coronary intervention; VF: ventricular fibrillation*

OUTCOMES OF IMAGING- VERSUS ANGIOGRAPHY-GUIDED PCI

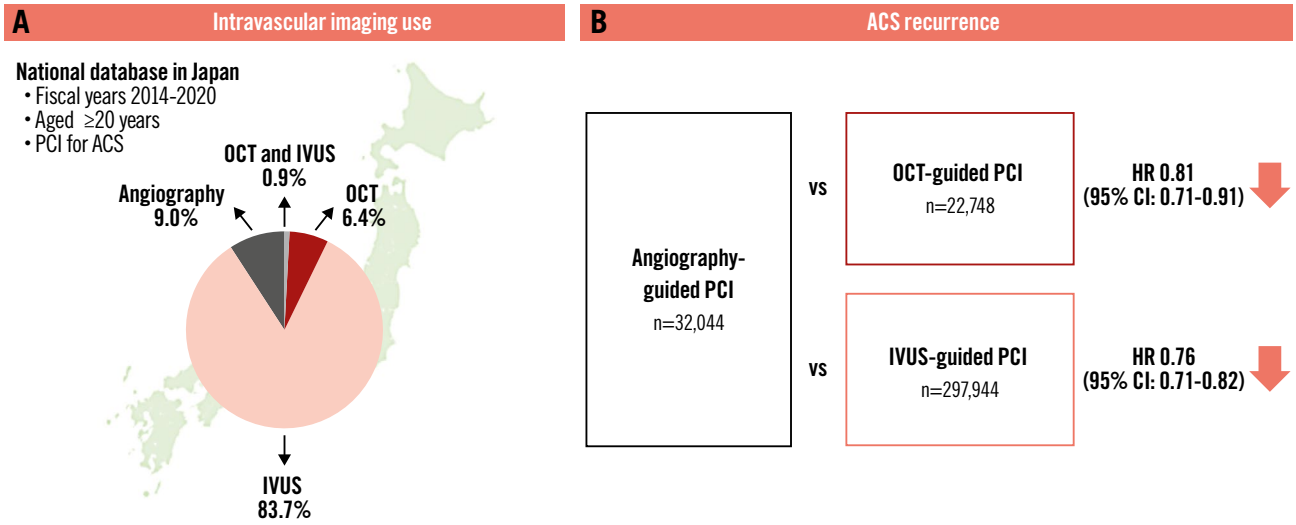
The median follow-up period after PCI was 1,113 days (interquartile range 489-1,841 days). Crude event rates for the primary and secondary outcomes during the 3-year follow-up are shown in **Supplementary Table 3** and **Supplementary Figure 2**. We performed an analysis focusing on the comparison between the imaging-guided PCI group and the angiography-guided PCI group. After weighting, all baseline covariates had an absolute standardised mean difference below 0.1, indicating a good balance between groups **(Supplementary Figure 3)**. Weighted clinical outcomes for the primary and secondary outcomes over the 3-year follow-up are presented in **Supplementary Table 4** and **Supplementary Figure 4**. The incidence of the primary outcome was lower in the imaging-guided PCI group (HR 0.76, 95% confidence interval [CI]: 0.70-0.82; p<0.001), and the incidence of the secondary outcome was also lower in the imaging-guided PCI group (HR 0.85, 95% CI: 0.82-0.89; p<0.001).

OUTCOMES OF OCT- OR IVUS-GUIDED PCI VERSUS ANGIOGRAPHY-GUIDED PCI

We performed a subsequent analysis focusing on the imaging-guided (OCT or IVUS) PCI group. Crude event rates for the primary and secondary outcomes during the 3-year follow-up are shown in **Supplementary Table 3** and **Supplementary Figure 5**. Crude event rates for the primary outcome were 586 patients (1.22 per 100 person-years) in OCT-guided PCI, 7,101 patients (1.11 per 100 person-years) in IVUS-guided PCI, and 1,121 patients (1.47 per 100 person-years) in angiography-guided PCI. Adjusted

EuroIntervention — Central Illustration

Intravascular imaging-guided percutaneous coronary intervention in patients with acute coronary syndrome.



Koki Takegawa *et al.* • *EuroIntervention* 2026;22:e292-e300 • DOI: 10.4244/EIJ-D-25-01092

A) Intravascular imaging use. B) Recurrence of ACS. ACS: acute coronary syndrome; CI: confidence interval; HR: hazard ratio; IVUS: intravascular ultrasound; OCT: optical coherence tomography; PCI: percutaneous coronary intervention

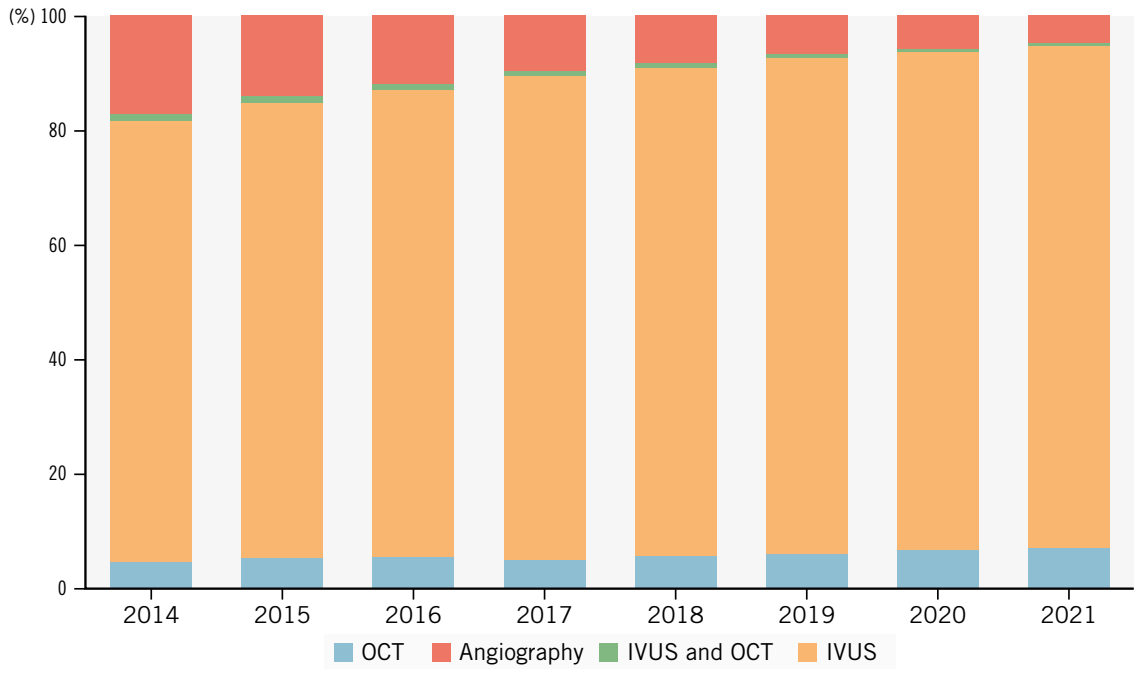


Figure 2. *Annual changes in the utilisation rate of intravascular imaging in patients with ACS. ACS: acute coronary syndrome; IVUS: intravascular ultrasound; OCT: optical coherence tomography*

clinical outcomes for the primary and secondary outcomes over the 3-year follow-up are presented in **Table 2**, **Supplementary Table 5**, **Figure 3**, **Supplementary Figure 6**, and **Supplementary Figure 7**. The incidence of the primary outcome was lower in the OCT-guided PCI group (HR 0.81, 95% CI: 0.71-0.91; p<0.001) and in the IVUS-guided PCI group (HR 0.76, 95% CI: 0.71-0.82; p<0.001), and the incidence of the secondary outcome was also lower

Table 1. Baseline patient characteristics.

	Angiography-guided PCI n=32,044	OCT-guided PCI n=22,748	IVUS-guided PCI n=297,944
Age category			
<60 years	5,900 (18.4)	5,294 (23.3)	62,707 (21.0)
60-69 years	7,453 (23.3)	6,031 (26.5)	71,655 (24.0)
70-79 years	9,911 (30.9)	7,166 (31.5)	93,442 (31.4)
≥80 years	8,780 (27.4)	4,257 (18.7)	70,140 (23.5)
Female	9,094 (28.4)	5,258 (23.1)	71,783 (24.1)
Comorbidities/past medical history			
Hypertension	22,028 (68.7)	14,611 (64.2)	195,230 (65.5)
Diabetes mellitus	7,996 (25.0)	5,395 (23.7)	73,631 (24.7)
Dyslipidaemia	17,137 (53.5)	12,606 (55.4)	157,391 (52.8)
Atrial fibrillation	1,421 (4.4)	760 (3.3)	11,182 (3.8)
Peripheral vascular disease	4,730 (14.8)	3,111 (13.7)	37,915 (12.7)
Chronic kidney disease	2,430 (7.6)	1,368 (6.0)	21,761 (7.3)
Medications during hospitalisation			
Aspirin	29,595 (92.4)	21,408 (94.1)	284,092 (95.4)
$P2Y_{12}$ inhibitors	29,688 (92.7)	22,036 (96.9)	289,687 (97.2)
OAC	3,584 (11.2)	1,837 (8.1)	28,376 (9.5)
Statin	23,908 (74.6)	19,823 (87.1)	255,617 (85.8)
Clinical presentation			
Acute myocardial infarction	22,255 (69.5)	14,348 (63.1)	201,320 (67.6)
Unstable angina	9,789 (30.5)	8,400 (36.9)	96,624 (32.4)
Procedure during PCI			
DES	23,349 (72.9)	19,993 (87.6)	268,314 (90.1)
DCB	2,085 (6.5)	2,660 (11.7)	22,229 (7.5)
Adjunctive atherectomy*	515 (1.6)	699 (3.1)	6,864 (2.3)

Data are presented as n (%). *Adjunctive atherectomy refers to rotational atherectomy and orbital atherectomy. DCB: drug-coated balloon; DES: drug-eluting stent; IVUS: intravascular ultrasound; OAC: oral anticoagulant; OCT: optical coherence tomography; PCI: percutaneous coronary intervention

in the OCT-guided PCI group (HR 0.80, 95% CI: 0.74-0.87; p<0.001) and in the IVUS-guided PCI group (HR 0.86, 95% CI: 0.83-0.90; p<0.001) compared with the angiography-guided PCI group.

SUBGROUP ANALYSIS

The results of the subgroup analysis are shown in **Supplementary Figure 8**. No interactions were observed between subgroups based on age, sex, or diabetes mellitus. On the other hand, an interaction was found for peripheral vascular disease (p=0.013) and acute myocardial infarction (p<0.001), showing a lower incidence of ACS recurrence in the imaging-guided PCI group.

SENSITIVITY ANALYSIS

The sensitivity analysis results are shown in **Supplementary Table 4**-**Supplementary Table 10**, **Supplementary Figure 4**, and **Supplementary Figure 9**-**Supplementary Figure 13**. When the inclusion criteria were limited to patients without heart failure (HF) or those who underwent DES implantation, ACS recurrence was lower in the imaging-guided PCI group compared with the angiography-guided PCI group. The cumulative incidence of ACS recurrence and the absolute risk difference are presented in **Supplementary Table 11**. There was no difference between the groups for hip fracture (used as a negative control) **(Supplementary Table 12, Supplementary Figure 14)**.

Discussion

This study investigated the association between imaging-guided PCI and clinical outcomes in patients with ACS, compared with angiography-guided PCI, using the NDB, which covers almost all patients in Japan. Our findings indicate that intravascular imaging was used in over 90% of cases, and both OCT- and IVUS-guided PCI were associated with a lower recurrence of ACS compared with angiography-guided PCI. Sensitivity analysis supported the robustness of these findings.

The proportion of imaging-guided PCI increased annually, while that of angiography-guided PCI without the use of intravascular imaging declined. This trend aligns with a global increase in the use of intravascular imaging reported in other countries[6,7]. Among the intravascular imaging modalities, IVUS was used more frequently than OCT in ACS patients. The proportion of OCT-guided PCI gradually increased to 6.9%. This lower use of OCT may be due to the requirements both for contrast agents in patients with chronic kidney

Table 2. Primary outcome (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI.

	OCT- and IVUS-guided PCI		Angiography-guided PCI		HR (95% CI)	*p*-value
	Total events	Incidence rate/100 person-years (95% CI)	Total events	Incidence rate/100 person-years (95% CI)		
OCT-guided PCI vs angiography-guided PCI						
IPTW	647/22,731	1.25 (1.12-1.38)	1,117/32,199	1.54 (1.44-1.64)	0.81 (0.71-0.91)	<0.001
Multivariable Cox	586/22,748	1.22 (1.13-1.32)	1,121/32,044	1.47 (1.39-1.56)	0.75 (0.68-0.84)	<0.001
PS matching	495/17,857	1.20 (1.10-1.31)	619/17,857	1.54 (1.42-1.66)	0.78 (0.69-0.88)	<0.001
IVUS-guided PCI versus angiography-guided PCI						
IPTW	7,247/297,979	1.12 (1.09-1.14)	1,016/32,053	1.46 (1.36-1.57)	0.76 (0.71-0.82)	<0.001
Multivariable Cox	7,101/297,944	1.11 (1.08-1.13)	1,121/32,044	1.47 (1.39-1.56)	0.78 (0.73-0.83)	<0.001
PS matching	925/31,951	1.20 (1.13-1.28)	1,115/31,951	1.47 (1.38-1.55)	0.82 (0.75-0.89)	<0.001

Data are presented as n/N. Models were adjusted using the baseline covariates, including age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year. CI: confidence interval; HR: hazard ratio; IPTW: inverse probability of treatment weighting; IVUS: intravascular ultrasound; OCT: optical coherence tomography; PCI: percutaneous coronary intervention; PS: propensity score

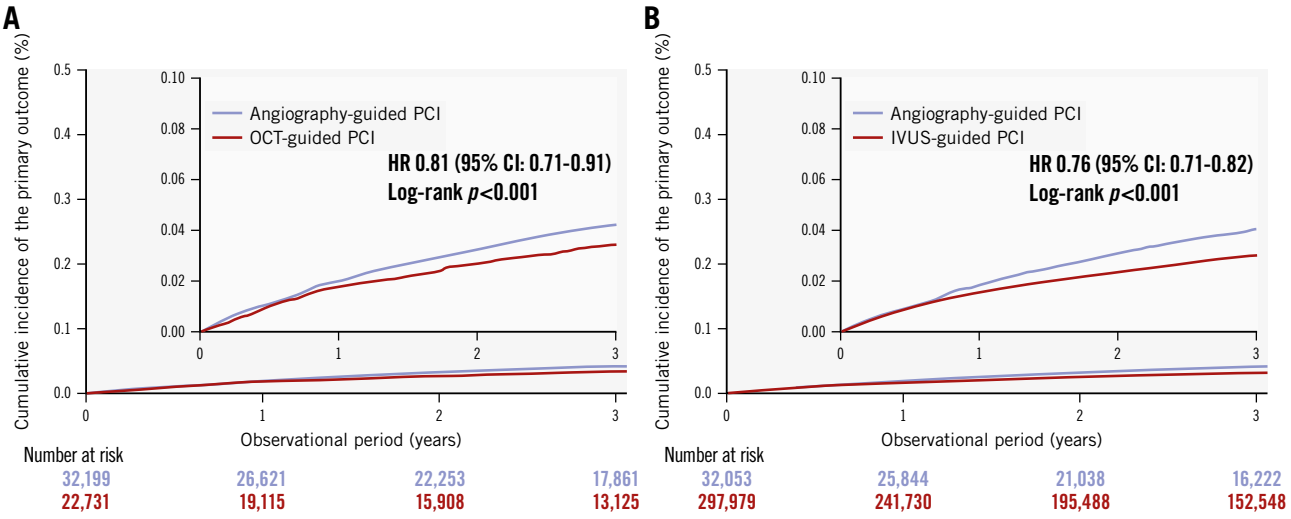


Figure 3. *Kaplan-Meier curves for the primary outcome (ACS recurrence) after IPTW. A) OCT-guided PCI versus angiography-guided PCI; (B) IVUS-guided PCI versus angiography-guided PCI. ACS: acute coronary syndrome; CI: confidence interval; HR: hazard ratio; IPTW: inverse probability of treatment weighting; IVUS: intravascular ultrasound; OCT: optical coherence tomography; PCI: percutaneous coronary intervention*

disease and for technical expertise in OCT-guided PCI[5,24-27]. In Europe and America, the use of intravascular imaging during PCI has been reported to be low[28,29]. The findings of this study and the IVUS-ACS trial align with current guideline recommendations[1,2].

Imaging-guided PCI for ACS was associated with a lower recurrence of ACS. A previous RCT demonstrated a reduction in target vessel failure at the 1-year follow-up in IVUS-guided PCI compared with angiography-guided PCI in patients with ACS[10,17]. Our study, including patients in real-world settings with a 3-year follow-up, demonstrated consistent results. These results imply that imaging-guided PCI for ACS could be useful in generalisable populations, and they may promote imaging-guided PCI in clinical practice.

OCT-guided PCI was associated with fewer negative outcomes compared with angiography-guided PCI in patients with ACS. OCT provides higher resolution than IVUS, allowing for a more detailed assessment of culprit lesions and optimal stent implantation. One RCT has reported that OCT-guided PCI resulted in a lower incidence of target vessel failure compared with angiography-guided PCI in patients with complex coronary artery lesions[14]. There have been few large-scale studies that have investigated the impact of OCT-guided PCI on long-term outcomes[30-35]; our results suggest that OCT-guided PCI may be an important option in patients with ACS.

This study was the largest to date on the use of imaging-guided PCI, including both OCT and IVUS, for ACS patients in a real-world setting. However, RCTs in patients with ACS are still lacking. Further RCTs are warranted to establish evidence for the use of imaging-guided PCI, including OCT-guided PCI, in patients with ACS.

Limitations

This study has several limitations due to its observational design. Although we adjusted for comorbidities such as dialysis and chronic kidney disease, the NDB does not include detailed data on factors such as renal function and activities of daily living, which may have led to residual confounding. Second, this study does not include detailed intravascular imaging findings. Third, since this study is based on the Japanese population, its findings may not be directly applicable to other geographic regions. Finally, we did not evaluate costs or cost-effectiveness, as our claims data lacked itemised device prices.

Conclusions

In this nationwide study, both OCT- and IVUS-guided PCI were associated with a reduction in ACS recurrence. These findings highlight the potential benefits of imaging-guided PCI in ACS management. In patients with ACS, increased utilisation of intravascular imaging may contribute to a reduction in ACS recurrence.

Authors' affiliations

1. Department of Medical and Health Information Management, National Cerebral and Cardiovascular Center, Suita, Japan; 2. Department of Cardiovascular Medicine, Institute of Science Tokyo, Tokyo, Japan; 3. Department of Cardiology, Sakurabashi Watanabe Hospital, Osaka, Japan; 4. Department of Public Health, Health Management and Policy, Nara Medical University, Kashihara, Japan; 5. Department of Community Health and Preventive Medicine, Hamamatsu University School of Medicine, Hamamatsu, Japan; 6. Department of Public Health Informatics, Kansai Medical University, Hirakata, Japan; 7. Open Innovation Center, National Cerebral and Cardiovascular Center, Suita, Japan

Funding

This work was supported by the Japan Society for the Promotion of Science KAKENHI grant 24K19047 and the Asahipen Hikari Foundation grant JP25APH621 for the publication of this article.

Conflict of interest statement

K. Kanaoka has received speaker honoraria from Eli Lilly Japan and Otsuka Pharmaceutical Co.; and has received consultation fees from Johnson & Johnson. The other authors have no conflicts of interest to declare.

References

1. 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.

2. Rao SV, O'Donoghue ML, Ruel M, Rab T, Tamis-Holland JE, Alexander JH, Baber U, Baker H, Cohen MG, Cruz-Ruiz M, Davis LL, de Lemos JA, DeWald TA, Elgendy IY, Feldman DN, Goyal A, Isiadinso I, Menon V, Morrow DA, Mukherjee D, Platz E, Promes SB, Sandner S, Sandoval Y, Schunder R, Shah B, Stopyra JP, Talbot AW, Taub PR, Williams MS. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2025;151:e771-862.

3. Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, Claeys MJ, Dan GA, Dweck MR, Galbraith M, Gilard M, Hinterbuchner L, Jankowska EA, Jüni P, Kimura T, Kunadian V, Leosdottir M, Lorusso R, Pedretti RFE, Rigopoulos AG, Rubini Gimenez M, Thiele H, Vranckx P, Wassmann S, Wenger NK, Ibanez B; ESC Scientific Document Group. 2023 ESC Guidelines for the management of acute coronary syndromes. *Eur Heart J*. 2023;44:3720-826.

4. Lawton JS, Tamis-Holland JE, Bangalore S, Bates ER, Beckie TM, Bischoff JM, Bittl JA, Cohen MG, DiMaio JM, Don CW, Fremes SE, Gaudino MF, Goldberger ZD, Grant MC, Jaswal JB, Kurlansky PA, Mehran R, Metkus TS Jr, Nnacheta LC, Rao SV, Sellke FW, Sharma G, Yong CM, Zwischenberger BA. 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2022;145:e18-114.

5. Truesdell AG, Alasnag MA, Kaul P, Rab ST, Riley RF, Young MN, Batchelor WB, Maehara A, Welt FG, Kirtane AJ; ACC Interventional Council. Intravascular Imaging During Percutaneous Coronary Intervention: JACC State-of-the-Art Review. *J Am Coll Cardiol*. 2023;81:590-605.

6. Almajid F, Kang DY, Ahn JM, Park SJ, Park DW. Optical coherence tomography to guide percutaneous coronary intervention. *EuroIntervention*. 2024;20:e1202-16.

7. Fazel R, Yeh RW, Cohen DJ, Rao SV, Li S, Song Y, Secemsky EA. Intravascular imaging during percutaneous coronary intervention: temporal trends and clinical outcomes in the USA. *Eur Heart J*. 2023;44:3845-55.

8. Vallabhajosyula S, El Hajj SC, Bell MR, Prasad A, Lerman A, Rihal CS, Holmes DR Jr, Barsness GW. Intravascular ultrasound, optical coherence tomography, and fractional flow reserve use in acute myocardial infarction. *Catheter Cardiovasc Interv*. 2020;96:E59-66.

9. Lee JM, Choi KH, Song YB, Lee JY, Lee SJ, Lee SY, Kim SM, Yun KH, Cho JY, Kim CJ, Ahn HS, Nam CW, Yoon HJ, Park YH, Lee WS, Jeong JO, Song PS, Doh JH, Jo SH, Yoon CH, Kang MG, Koh JS, Lee KY, Lim YH, Cho YH, Cho JM, Jang WJ, Chun KJ, Hong D, Park TK, Yang JH, Choi SH, Gwon HC, Hahn JY; RENOVATE-COMPLEX-PCI Investigators. Intravascular Imaging-Guided or Angiography-Guided Complex PCI. *N Engl J Med*. 2023;388:1668-79.

10. Gao XF, Ge Z, Kong XQ, Kan J, Han L, Lu S, Tian NL, Lin S, Lu QH, Wang XY, Li QH, Liu ZZ, Chen Y, Qian XS, Wang J, Chai DY, Chen CH, Pan T, Ye F, Zhang JJ, Chen SL; ULTIMATE Investigators. 3-Year Outcomes of the ULTIMATE Trial Comparing Intravascular Ultrasound Versus Angiography-Guided Drug-Eluting Stent Implantation. *JACC Cardiovasc Interv*. 2021;14:247-57.

11. Chamié D, Costa JR Jr, Damiani LP, Siqueira D, Braga S, Costa R, Seligman H, Brito F, Barreto G, Staico R, Feres F, Petraco R, Abizaid A. Optical Coherence Tomography Versus Intravascular Ultrasound and Angiography to Guide Percutaneous Coronary Interventions: The iSIGHT Randomized Trial. *Circ Cardiovasc Interv*. 2021;14:e009452.

12. Muramatsu T, Ozaki Y, Nanasato M, Ishikawa M, Nagasaka R, Ohota M, Hashimoto Y, Yoshiki Y, Takatsu H, Ito K, Kamiya H, Yoshida Y, Murohara T, Izawa H; MISTIC-1 Investigators. Comparison Between Optical Frequency Domain Imaging and Intravascular Ultrasound for Percutaneous Coronary Intervention Guidance in Biolimus A9-Eluting Stent Implantation: A Randomized MISTIC-1 Non-Inferiority Trial. *Circ Cardiovasc Interv*. 2020;13:e009314.

13. Ladwiniec A, Walsh SJ, Holm NR, Hanratty CG, Mäkikallio T, Kellerth T, Hildick-Smith D, Mogensen LJH, Hartikainen J, Menown IBA, Erglis A, Eriksen E, Spence MS, Thuesen L, Christiansen EH. Intravascular ultrasound to guide left main stem intervention: a NOBLE trial substudy. *EuroIntervention*. 2020;16:201-9.

14. Hong SJ, Lee SJ, Lee SH, Lee JY, Cho DK, Kim JW, Kim SM, Hur SH, Heo JH, Jang JY, Koh JS, Won H, Lee JW, Hong SJ, Kim DK, Choe JC, Lee JB, Kim SJ, Yang TH, Lee JH, Hong YJ, Ahn JH, Lee YJ, Ahn CM, Kim JS, Ko YG, Choi D, Hong MK, Jang Y, Kim BK; OCCUPI investigators. Optical coherence tomography-guided versus angiography-guided percutaneous coronary intervention for patients with complex lesions (OCCUPI): an investigator-initiated, multicentre, randomised, open-label, superiority trial in South Korea. *Lancet*. 2024;404:1029-39.

15. Kubo T, Shinke T, Okamura T, Hibi K, Nakazawa G, Morino Y, Shite J, Fusazaki T, Otake H, Kozuma K, Ioji T, Kaneda H, Serikawa T, Kataoka T, Okada H, Akasaka T; OPINION Investigators. Optical frequency domain imaging vs. intravascular ultrasound in percutaneous coronary intervention (OPINION trial): one-year angiographic and clinical results. *Eur Heart J*. 2017;38:3139-47.

16. Stone GW, Christiansen EH, Ali ZA, Andreasen LN, Maehara A, Ahmad Y, Landmesser U, Holm NR. Intravascular imaging-guided coronary drug-eluting stent implantation: an updated network meta-analysis. *Lancet*. 2024;403:824-37.

17. Giacoppo D, Laudani C, Occhip$_{int}$i G, Spagnolo M, Greco A, Rochira C, Agnello F, Landolina D, Mauro MS, Finocchiaro S, Mazzone PM, Ammirabile N, Imbesi A, Raffo C, Buccheri S, Capodanno D. Coronary Angiography, Intravascular Ultrasound, and Optical Coherence Tomography for Guiding of Percutaneous Coronary Intervention: A Systematic Review and Network Meta-Analysis. *Circulation*. 2024;149:1065-86.

18. Landmesser U, Ali ZA, Maehara A, Matsumura M, Shlofmitz RA, Guagliumi G, Price MJ, Hill JM, Akasaka T, Prati F, Bezerra HG, Wijns W, Leistner D, Canova P, Alfonso F, Fabbiocchi F, Calligaris G, Oemrawsingh RM, Achenbach S, Trani C, Singh B, McGreevy RJ, McNutt RW, Ying SW, Buccola J, Stone GW. Optical coherence tomography predictors of clinical outcomes after stent implantation: the ILUMIEN IV trial. *Eur Heart J*. 2024;45:4630-43.

19. Kang DY, Ahn JM, Yun SC, Hur SH, Cho YK, Lee CH, Hong SJ, Lim S, Kim SW, Won H, Oh JH, Choe JC, Hong YJ, Yoon YH, Kim H, Choi Y, Lee J, Yoon YW, Kim SJ, Bae JH, Park DW, Park SJ; OCTIVUS Investigators. Optical Coherence Tomography-Guided or Intravascular Ultrasound-Guided Percutaneous Coronary Intervention: The OCTIVUS Randomized Clinical Trial. *Circulation*. 2023;148:1195-206.

20. Gao X, Kan J, Wu Z, Anjun M, Chen X, Chen J, Sheiban I, Mintz GS, Zhang JJ, Stone GW, Chen SL; IVUS-ACS Investigators. IVUS-Guided vs Angiography-Guided PCI in Patients With Diabetes With Acute Coronary Syndromes: The IVUS-ACS Trial. *JACC Cardiovasc Interv*. 2025;18:283-93.

21. Maehara A, Matsumura M, Ali ZA, Mintz GS, Stone GW. IVUS-Guided Versus OCT-Guided Coronary Stent Implantation: A Critical Appraisal. *JACC Cardiovasc Imaging*. 2017;10:1487-503.

22. Ali ZA, Landmesser U, Maehara A, Matsumura M, Shlofmitz RA, Guagliumi G, Price MJ, Hill JM, Akasaka T, Prati F, Bezerra HG, Wijns W, Leistner D, Canova P, Alfonso F, Fabbiocchi F, Dogan O, McGreevy RJ, McNutt RW, Nie H, Buccola J, West NEJ, Stone GW; ILUMIEN IV Investigators. Optical Coherence Tomography-Guided versus Angiography-Guided PCI. *N Engl J Med*. 2023;389:1466-76.

23. Myojin T, Noda T, Kubo S, Nishioka Y, Higashino T, Imamura T. Development of a New Method to Trace Patient Data Using the National Database in Japan. *Adv Biomed Eng*. 2022;11:203-17.

24. Osborn EA, Johnson M, Maksoud A, Spoon D, Zidar FJ, Korngold EC, Buccola J, Garcia Cabrera H, Rapoza RJ, West NEJ, Rauch J. Safety and efficiency of percutaneous coronary intervention using a standardised optical coherence tomography workflow. *EuroIntervention*. 2023;18:1178-87.

25. 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.

26. Yonetsu T, Lee T, Murai T, Suzuki M, Matsumura A, Hashimoto Y, Kakuta T. Plaque morphologies and the clinical prognosis of acute coronary syndrome caused by lesions with intact fibrous cap diagnosed by optical coherence tomography. *Int J Cardiol*. 2016;203:766-74.

27. Prati F, Romagnoli E, Burzotta F, Limbruno U, Gatto L, La Manna A, Versaci F, Marco V, Di Vito L, Imola F, Paoletti G, Trani C, Tamburino C, Tavazzi L, Mintz GS. Clinical Impact of OCT Findings During PCI: The CLI-OPCI II Study. *JACC Cardiovasc Imaging*. 2015;8:1297-305.

28. 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.

29. Madder RD, Seth M, Sukul D, Alraies MC, Qureshi M, Tucciarone M, Saltiel F, Qureshi MI, Gurm HS. Rates of Intracoronary Imaging Optimization in Contemporary Percutaneous Coronary Intervention: A Report From the BMC2 Registry. *Circ Cardiovasc Interv*. 2022;15:e012182.

30. Soeda T, Uemura S, Park SJ, Jang Y, Lee S, Cho JM, Kim SJ, Vergallo R, Minami Y, Ong DS, Gao L, Lee H, Zhang S, Yu B, Saito Y, Jang IK. Incidence and Clinical Significance of Poststent Optical Coherence Tomography Findings: One-Year Follow-Up Study From a Multicenter Registry. *Circulation*. 2015;132:1020-9.

31. Ali ZA, Maehara A, Généreux P, Shlofmitz RA, Fabbiocchi F, Nazif TM, Guagliumi G, Meraj PM, Alfonso F, Samady H, Akasaka T, Carlson EB, Leesar MA, Matsumura M, Ozan MO, Mintz GS, Ben-Yehuda O, Stone GW; ILUMIEN III: OPTIMIZE PCI Investigators. Optical coherence tomography compared with intravascular ultrasound and with angiography to guide coronary stent implantation (ILUMIEN III: OPTIMIZE PCI): a randomised controlled trial. *Lancet*. 2016;388:2618-28.

32. Holm NR, Andreasen LD, Neghabat O, Laanmets P, Kumsars I, Bennett J, Olsen NT, Odenstedt J, Hoffmann P, Dens J, Chowdhary S, O'Kane P, Bülow Rasmussen SH, Heigert M, Havndrup O, Van Kuijk JP, Biscaglia S, Mogensen LJH, Henareh L, Burzotta F, H Eek C, Mylotte D, Llinas MS, Koltowski L, Knaapen P, Calic S, Witt N, Santos-Pardo I, Watkins S, Lønborg J, Kristensen AT, Jensen LO, Calais F, Cockburn J, McNeice A, Kajander OA, Heestermans T, Kische S, Eftekhari A, Spratt JC, Christiansen EH; OCTOBER Trial Group. OCT or Angiography Guidance for PCI in Complex Bifurcation Lesions. *N Engl J Med*. 2023;389:1477-87.

33. Hong SJ, Mintz GS, Ahn CM, Kim JS, Kim BK, Ko YG, Kang TS, Kang WC, Kim YH, Hur SH, Hong BK, Choi D, Kwon H, Jang Y, Hong MK; IVUS-XPL Investigators. Effect of Intravascular Ultrasound-Guided Drug-Eluting Stent Implantation: 5-Year Follow-Up of the IVUS-XPL Randomized Trial. *JACC Cardiovasc Interv*. 2020;13:62-71.

34. Meneveau N, Souteyrand G, Motreff P, Caussin C, Amabile N, Ohlmann P, Morel O, Lefrançois Y, Descotes-Genon V, Silvain J, Braik N, Chopard R, Chatot M, Ecarnot F, Tauzin H, Van Belle E, Belle L, Schiele F. Optical Coherence Tomography to Optimize Results of Percutaneous Coronary Intervention in Patients with Non-ST-Elevation Acute Coronary Syndrome: Results of the Multicenter, Randomized DOCTORS Study (Does Optical Coherence Tomography Optimize Results of Stenting). *Circulation*. 2016;134:906-17.

35. Araki M, Park SJ, Dauerman HL, Uemura S, Kim JS, Di Mario C, Johnson TW, Guagliumi G, Kastrati A, Joner M, Holm NR, Alfonso F, Wijns W, Adriaenssens T, Nef H, Rioufol G, Amabile N, Souteyrand G, Meneveau N, Gerbaud E, Opolski MP, Gonzalo N, Tearney GJ, Bouma B, Aguirre AD, Mintz GS, Stone GW, Bourantas CV, Räber L, Gili S, Mizuno K, Kimura S, Shinke T, Hong MK, Jang Y, Cho JM, Yan BP, Porto I, Niccoli G, Montone RA, Thondapu V, Papafaklis MI, Michalis LK, Reynolds H, Saw J, Libby P, Weisz G, Iannaccone M, Gori T, Toutouzas K, Yonetsu T, Minami Y, Takano M, Raffel OC, Kurihara O, Soeda T, Sugiyama T, Kim HO, Lee T, Higuma T, Nakajima A, Yamamoto E, Bryniarski KL, Di Vito L, Vergallo R, Fracassi F, Russo M, Seegers LM, McNulty I, Park S, Feldman M, Escaned J, Prati F, Arbustini E, Pinto FJ, Waksman R, Garcia-Garcia HM, Maehara A, Ali Z, Finn AV, Virmani R, Kini AS, Daemen J, Kume T, Hibi K, Tanaka A, Akasaka T, Kubo T, Yasuda S, Croce K, Granada JF, Lerman A, Prasad A, Regar E, Saito Y, Sankardas MA, Subban V, Weissman NJ, Chen Y, Yu B, Nicholls SJ, Barlis P, West NEJ, Arbab-Zadeh A, Ye JC, Dijkstra J, Lee H, Narula J, Crea F, Nakamura S, Kakuta T, Fujimoto J, Fuster V, Jang IK. Optical coherence tomography in coronary atherosclerosis assessment and intervention. *Nat Rev Cardiol*. 2022;19:684-703.

Supplementary data

Supplementary Table 1. Definitions and coding of diseases and treatments.

Supplementary Table 2. Baseline patient characteristics.

Supplementary Table 3. Crude outcomes (at 3 years) of imaging-guided (OCT or IVUS) PCI versus angiography-guided PCI.

Supplementary Table 4. Clinical outcomes (at 3 years) of imaging-guided PCI versus angiography-guided PCI.
Supplementary Table 5. Primary outcome (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI.
Supplementary Table 6. Baseline characteristics of imaging-guided PCI versus angiography-guided PCI after PS matching.
Supplementary Table 7. Baseline characteristics of OCT-guided PCI versus angiography-guided PCI after PS matching.
Supplementary Table 8. Baseline characteristics of IVUS-guided PCI versus angiography-guided PCI after PS matching.
Supplementary Table 9. Clinical outcomes (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI in patients without HF after IPTW.
Supplementary Table 10. Clinical outcomes (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI in patients with DES implantation after IPTW.
Supplementary Table 11. Cumulative incidence of ACS recurrence by index year: imaging-guided versus angiography-guided PCI.
Supplementary Table 12. Negative control outcome (hip fracture) of imaging-guided PCI versus angiography-guided PCI after IPTW.
Supplementary Figure 1. Study design.
Supplementary Figure 2. Crude Kaplan-Meier curves for the primary and the secondary outcomes comparing imaging-guided PCI with angiography-guided PCI.
Supplementary Figure 3. Covariate balance between imaging-guided PCI and angiography-guided PCI before and after IPTW.
Supplementary Figure 4. Kaplan-Meier curves for the primary and secondary outcomes after IPTW and PS matching comparing imaging-guided PCI with angiography-guided PCI.
Supplementary Figure 5. Crude Kaplan-Meier curves for the primary and secondary outcomes.
Supplementary Figure 6. Covariate balance between OCT-guided PCI and angiography-guided PCI before and after IPTW.
Supplementary Figure 7. Covariate balance between IVUS-guided PCI and angiography-guided PCI before and after IPTW.
Supplementary Figure 8. Subgroup analysis of the primary outcome (ACS recurrence) using a multivariable Cox model.
Supplementary Figure 9. Kaplan-Meier curves for the primary and secondary outcomes after PS matching, comparing OCT- and IVUS-guided PCI with angiography-guided PCI.
Supplementary Figure 10. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients without HF (sensitivity analysis), comparing OCT- and IVUS-guided PCI with angiography-guided PCI.
Supplementary Figure 11. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients with DES implantation (sensitivity analysis), comparing OCT- and IVUS-guided PCI with angiography-guided PCI.
Supplementary Figure 12. Kaplan-Meier curves for the primary outcome and the secondary outcome after IPTW in patients without HF (sensitivity analysis), comparing imaging-guided PCI with angiography-guided PCI.
Supplementary Figure 13. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients with DES implantation (sensitivity analysis), comparing imaging-guided PCI with angiography-guided PCI.
Supplementary Figure 14. Negative control outcome (hip fracture) of imaging-guided PCI versus angiography-guided PCI after IPTW.

The supplementary data are published online at: https://eurointervention.pcronline.com/doi/10.4244/EIJ-D-25-01092

Supplementary data

Supplementary Table 1. Definitions and coding of diseases and treatments.

Definitions	ICD-10 codes or Definitions (procedure or claims codes)
Definitions of diseases	
Hypertension	ICD-10: I10, I11, I12, I13, I14, or I15 with antihypertensive drugs
Diabetes mellitus	ICD-10: E10, E11, E12, E13, E14, or E15 with hypoglycemic drugs
Dyslipidemia	ICD-10: E78
Peripheral vascular disease	ICD-10: I70, I73, I74
Chronic kidney disease	ICD-10: N18, N19, and codes suggesting chronic kidney disease from E102, E112, E142 (diabetic nephropathy), I120 and I129 (hypertensive nephropathy)
COPD	ICD-10: J43, J44 and inhalers including ICS, SABA, LABA, SABA, SAMA, LAMA
Atrial fibrillation	ICD-10: I480, I481, I482, and I489 except for atrial flutter with anticoagulation drugs
Malignancy	ICD-10: C*
HF hospitalisation	ICD-10: I50 with admission
Stroke	ICD-10: I63 with procedural codes of stroke rehabilitation, treated in stroke care unit, or treated with t-PA, edarabon, or ozagrel. ICD-10: I60, I61, and I62 with stroke rehabilitation or patients who underwent brain surgery.

Hemodialysis	Claim codes: 113002510, 114009310, 114009410, 140036710, 140051010, 140051110, 140052810, 140057810, 140057910, 140058010, 140058110, 140058210, 140058310, 140058410, 140058510, 140058610, 140059310, 140059410, 140059510, 114003510, 114003610, 140008510, 140008810
Treatments	
PCI for ACS	Claim codes: 150374910, 150375010, 150375210, 150375310
DES	Claim codes: 710010026, 710011014, 710011016
BMS	
DCB	Claim codes: 710010754, 710010755
POBA	Claim codes: 710010083, 710010754, 732590000, 732600000, 732620000, 710010755, 732610000
Adjunctive atherectomy	Claim codes: 150284310, 150443750
Thrombectomy	Claim codes: 150318310
Temporary pacemaker	Claim codes: 737010000
Mechanical circulatory support	Claim codes: 727610000, 727630000, 727620000, 710011021, 737100000, 737110000, 737120000, 710010014, 710010015, 710011021, 738960000, 729610000, 729620000, 729630000, 729640000, 729650000, 729660000, 729670000, 729680000, 710010613, 729690000, 710010952, 721010000, 729700000, 729710000, 737130000, 737140000, 737150000, 737160000, 737170000, 737180000, 737190000, 737200000, 737210000, 737220000, 737230000, 737240000, 737250000, 737260000, 710010779, 737270000, 737280000
Hip fracture	ICD-10: M80, M84, S32, S72, S82, S92, T02.3, T02.5, T02.6, T02.7, T12, T93

ACS, acute coronary syndrome; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; ICD-10, 10th revision of the International Statistical Classification of Diseases and Related Health

Problems; NSAIDs, non-steroidal anti-inflammatory drug; OAC, oral anticoagulant; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; RAS inhibitors, renin-angiotensin system inhibitors.

Supplementary Table 2. Baseline patient characteristics.

	Angiography-guided PCI n = 32,044	OCT-guided PCI n = 22,748	IVUS-guided PCI n = 297,944
Age category			
<60	5,900 (18.4)	5,294 (23.3)	62,707 (21.0)
60–69	7,453 (23.3)	6,031 (26.5)	71,655 (24.0)
70–79	9,911 (30.9)	7,166 (31.5)	93,442 (31.4)
>80	8,780 (27.4)	4,257 (18.7)	70,140 (23.5)
Female	9,094 (28.4)	5,258 (23.1)	71,783 (24.1)
Comorbidities/ Past medical history			
Hypertension	22,028 (68.7)	14,611 (64.2)	195,230 (65.5)
Diabetes mellitus	7,996 (25.0)	5,395 (23.7)	73,631 (24.7)
Dyslipidemia	17,137 (53.5)	12,606 (55.4)	157,391 (52.8)
Atrial fibrillation	1,421 (4.4)	760 (3.3)	11,182 (3.8)
Peripheral vascular disease	4,730 (14.8)	3,111 (13.7)	37,915 (12.7)
Chronic kidney disease	2,430 (7.6)	1,368 (6.0)	21,761 (7.3)
COPD	1,406 (4.4)	1,056 (4.6)	13,389 (4.5)
Malignancy	2,551 (8.0)	1,821 (8.0)	23,462 (7.9)
HF hospitalisation	1,284 (4.0)	756 (3.3)	10,806 (3.6)
Stroke	1,372 (4.3)	751 (3.3)	11,789 (4.0)
Hemodialysis	987 (3.1)	637 (2.8)	7,657 (2.6)
Medications before hospitalisation			
Aspirin	7,073 (22.1)	5,323 (23.4)	59,555 (20.0)

P2Y12 inhibitors	3,730 (11.6)	2,748 (12.1)	28,113 (9.4)
OAC	1,789 (5.6)	944 (4.1)	13,854 (4.6)
Statin	7,251 (22.6)	6,060 (26.6)	69,611 (23.4)
Beta blockers	4,884 (15.2)	3,503 (15.4)	41,970 (14.1)
RAS inhibitors	12,676 (39.6)	8,340 (36.7)	113,337 (38.0)
Calcium channel blockers	14,866 (46.4)	9,636 (42.4)	131,362 (44.1)
Insulin	1,577 (4.9)	1,012 (4.4)	14,521 (4.9)
NSAIDs	3,724 (11.6)	2,538 (11.2)	32,551 (10.9)
Medications during hospitalisation			
Aspirin	29,595 (92.4)	21,408 (94.1)	284,092 (95.4)
P2Y12 inhibitors	29,688 (92.7)	22,036 (96.9)	289,687 (97.2)
OAC	3,584 (11.2)	1,837 (8.1)	28,376 (9.5)
Statin	23,908 (74.6)	19,823 (87.1)	255,617 (85.8)
Clinical presentation			
Acute myocardial infarction	22,255 (69.5)	14,348 (63.1)	201,320 (67.6)
Unstable angina	9,789 (30.5)	8,400 (36.9)	96,624 (32.4)
Procedure during PCI			
Stent implantation			
DES	23,349 (72.9)	19,993 (87.6)	268,314 (90.1)
BMS	2,024 (6.3)	247 (1.1)	6,594 (2.2)
DCB	2,085 (6.5)	2,660 (11.7)	22,229 (7.5)
POBA	29,401 (91.8)	20,710 (91.0)	272,160 (91.3)
Adjunctive atherectomy*	515 (1.6)	699 (3.1)	6,864 (2.3)

Thrombectomy	13,652 (42.6)	10,302 (45.3)	141,831 (47.6)
Temporary pacemaker	2,636 (8.2)	1,263 (5.6)	23,551 (7.9)
Fiscal year			
2014–2015	11,249 (35.1)	4,231 (18.6)	58,850 (19.8)
2016–2017	9,268 (28.9)	5,246 (23.1)	74,316 (24.9)
2018–2019	6,838 (21.3)	6,160 (27.1)	82,164 (27.6)
2020–2021	4,689 (14.6)	7,111 (31.3)	82,614 (27.7)

Data are presented as numbers (%).

*Adjunctive atherectomy refers to rotational atherectomy and orbital atherectomy.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; IVUS, intravasular ultrasound; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; OCT, optical coherence tomography; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; RAS inhibitors, renin-angiotensin system inhibitors.

Supplementary Table 3. Crude outcomes (at 3 years) of imaging-guided (OCT or IVUS) PCI versus angiography-guided PCI.

	Imaging-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
Imaging-guided PCI vs Angiography-guided PCI						
Primary outcome	7,764/323,767	1.11 (1.09–1.14)	1,121/32,044	1.47 (1.39–1.56)	0.73 (0.69–0.78)	<0.001
Secondary outcome	25,726/323,767	3.69 (3.64–3.73)	3,694/32,044	4.86 (4.70–5.02)	0.75 (0.72–0.77)	<0.001
OCT-guided PCI vs Angiography-guided PCI						
Primary outcome	586/22,748	1.22 (1.13–1.32)	1,121/32,044	1.47 (1.39–1.56)	0.80 (0.73–0.89)	<0.001
Secondary outcome	1,479/22,748	3.08 (2.93–3.24)	3,694/32,044	4.86 (4.70–5.02)	0.62 (0.59–0.66)	<0.001
IVUS-guided PCI vs Angiography-guided PCI						
Primary outcome	7,101/297,944	1.11 (1.08–1.13)	1,121/32,044	1.47 (1.39–1.56)	0.73 (0.68–0.78)	<0.001
Secondary outcome	24,033/297,944	3.74 (3.69–3.78)	3,694/32,044	4.86 (4.70–5.02)	0.76 (0.73–0.79)	<0.001

The analysis was performed with univariable Cox analysis.

CI, confidence interval; HR, hazard ratio; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.

Supplementary Table 4. Clinical outcomes (at 3 years) of imaging-guided PCI versus angiography-guided PCI.

	Imaging-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
Primary outcome						
IPTW	7,908/323,796	1.12 (1.10–1.15)	1,026/32,084	1.47 (1.37–1.58)	0.76 (0.71–0.82)	<0.001
Multivariable Cox	7,764/323,767	1.11 (1.09–1.14)	1,121/32,044	1.47 (1.39–1.56)	0.78 (0.73–0.83)	<0.001
PS matching	912/31,976	1.18 (1.11–1.26)	1,116/31,976	1.47 (1.39–1.60)	0.80 (0.73–0.88)	<0.001
Excluded HF	6,862/275,200	1.13 (1.11–1.16)	866/26,765	1.47 (1.36–1.59)	0.77 (0.71–0.83)	<0.001
DES implantation	6,478/290,782	1.02 (1.00–1.05)	695/23,330	1.38 (1.27–1.49)	0.74 (0.68–0.80)	<0.001
Secondary outcome						
IPTW	26,453/323,796	3.75 (3.71–3.80)	3,059/32,084	4.39 (4.22–4.57)	0.85 (0.82–0.89)	<0.001
Multivariable Cox	25,726/323,767	3.69 (3.64–3.73)	3,694/32,044	4.86 (4.70–5.02)	0.86 (0.83–0.89)	<0.001

PS matching	3,169/31,976	4.11 (3.97–4.26)	3,678/31,976	4.85 (4.69–5.01)	0.84 (0.80–0.89)	<0.001
Excluded HF	19,209/275,200	3.17 (3.12–3.22)	2,220/26,765	3.76 (3.59–3.95)	0.84 (0.80–0.88)	<0.001
DES implantation	22,026/290,782	3.47 (3.42–3.51)	2,085/23,330	4.12 (3.95–4.31)	0.84 (0.80–0.88)	<0.001

The sensitivity analysis was performed with IPTW. Weights were generated using the baseline covariates, such as age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year.

CI, confidence interval; DES, drug-eluting stent; HF, heart failure; HR, hazard ratio; IPTW, inverse probability of treatment weighting; PCI, percutaneous coronary intervention; PS matching, propensity score matching.

Supplementary Table 5. Primary outcome (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI.

	OCT- and IVUS-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
OCT-guided PCI vs Angiography-guided PCI						
IPTW	647/22,731	1.25 (1.12–1.38)	1,117/32,199	1.54 (1.44–1.64)	0.81 (0.71–0.91)	<0.001
Multivariable Cox	586/22,748	1.22 (1.13–1.32)	1,121/32,044	1.47 (1.39–1.56)	0.75 (0.68–0.84)	<0.001
PS matching	495/17,857	1.20 (1.10–1.31)	619/17,857	1.54 (1.42–1.66)	0.78 (0.69–0.88)	<0.001
Excluded HF	602/20,337	1.29 (1.16–1.44)	946/26,900	1.54 (1.44–1.65)	0.83 (0.73–0.95)	0.006
DES implantation	461/20,037	1.00 (0.90–1.11)	752/23,298	1.43 (1.33–1.54)	0.70 (0.62–0.79)	<0.001
IVUS-guided PCI vs Angiography-guided PCI						
IPTW	7,247/297,979	1.12 (1.09–1.14)	1,016/32,053	1.46 (1.36–1.57)	0.76 (0.71–0.82)	<0.001
Multivariable Cox	7,101/297,944	1.11 (1.08–1.13)	1,121/32,044	1.47 (1.39–1.56)	0.78 (0.73–0.83)	<0.001
PS matching	925/31,951	1.20 (1.13–1.28)	1,115/31,951	1.47 (1.38–1.55)	0.82 (0.75–0.89)	<0.001
Excluded HF	6,263/252,251	1.13 (1.10–1.15)	858/26,745	1.45 (1.35–1.57)	0.77 (0.71–0.83)	<0.001
DES implantation	5,992/268,313	1.02 (1.00–1.05)	694/23,333	1.37 (1.27–1.48)	0.74 (0.68–0.80)	<0.001

Models were adjusted using the baseline covariates, such as age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year. Sensitivity analyses were separately performed in patients without HF and in those with DES implantation using IPTW.
CI, confidence interval; DES, drug-eluting stent; HF, heart failure; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention; PS matching, propensity score matching.

Supplementary Table 6. Baseline characteristics of imaging-guided PCI versus angiography-guided PCI after PS matching.

	Imaging-guided PCI n = 31,976	Angiography-guided PCI n = 31,976	|Std Diff|
Age category			0.009
<60	6,361 (19.9)	5,898 (18.4)	
60–69	7,618 (23.8)	7,444 (23.3)	
70–79	9,864 (30.8)	9,898 (31.0)	
>80	8,133 (25.4)	8,736 (27.3)	
Female	8,837 (27.6)	9,048 (28.3)	0.015
Comorbidities/ Past medical history			
Hypertension with antihypertensive drugs	21,690 (67.8)	21,970 (68.7)	0.019
Diabetes mellitus with hypoglycemic drugs	7,765 (24.3)	7,976 (24.9)	0.015
Dyslipidemia	16,886 (52.8)	17,106 (53.5)	0.014
Atrial fibrillation	1,250 (3.9)	1,414 (4.4)	0.026
Peripheral vascular disease	4,415 (13.8)	4,714 (14.7)	0.027
Chronic kidney disease	2,193 (6.9)	2,421 (7.6)	0.028
COPD	1,313 (4.1)	1,406 (4.4)	0.014
Malignancy	2,282 (7.1)	2,547 (8.0)	0.031
HF hospitalisation	1,165 (3.6)	1,278 (4.0)	0.018
Stroke	1,219 (3.8)	1,364 (4.3)	0.023
Hemodialysis	866 (2.7)	981 (3.1)	0.021
Medications before hospitalisation			
Aspirin	6,757 (21.1)	7,054 (22.1)	0.023

P2Y12 inhibitors	3,634 (11.4)	3,716 (11.6)	0.008
OAC	1,593 (5.0)	1,780 (5.6)	0.026
Strong statin	7,159 (22.4)	7,244 (22.7)	0.006
Beta blockers	4,511 (14.1)	4,868 (15.2)	0.032
RAS inhibitors	12,386 (38.7)	12,644 (39.5)	0.017
Calcium channel antagonist	14,712 (46.0)	14,823 (46.4)	0.007
Insulin	1,422 (4.4)	1,574 (4.9)	0.022
NSAIDs	3,516 (11.0)	3,714 (11.6)	0.020
PCI Procedure			
Stent implantation			
DES	23,367 (73.1)	23,349 (73.0)	0.001
BMS	2,117 (6.6)	2,024 (6.3)	0.012
DCB	2,126 (6.6)	2,085 (6.5)	0.005
POBA	29,584 (92.5)	29,346 (91.8)	0.028
Adjunctive atherectomy*	510 (1.6)	515 (1.6)	0.001
Thrombectomy	14,153 (44.3)	13,652 (42.7)	0.032
Temporary pacemaker	2,593 (8.1)	2,630 (8.2)	0.004
Fiscal year			0.019
2014–2015	11,092 (34.7)	11,186 (35.0)	
2016–2017	9,258 (29.0)	9,263 (29.0)	
2018–2019	6,882 (21.5)	6,838 (21.4)	
2020–2021	4,744 (14.8)	4,689 (14.7)	

Data are presented as numbers (%). All values are rounded after PS matching.

*Adjunctive atherectomy refers to rotational atherectomy and orbital atherectomy.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors.

Supplementary Table 7. Baseline characteristics of OCT-guided PCI versus angiography-guided PCI after PS matching.

	OCT-guided PCI n = 17,857	Angiography-guided PCI n = 17,857	|Std Diff|
Age category			0.018
<60	3,911 (21.9)	3,671 (20.6)	
60–69	4,599 (25.8)	4,661 (26.1)	
70–79	5,664 (31.7)	5,531 (31.0)	
>80	3,683 (20.6)	3,994 (22.4)	
Female	4,413 (24.7)	4,296 (24.1)	0.015
Comorbidities/ Past medical history			
Hypertension with antihypertensive drugs	11,927 (66.8)	11,567 (64.8)	0.043
Diabetes mellitus with hypoglycemic drugs	4,411 (24.7)	4,213 (23.6)	0.026
Dyslipidemia	9,951 (55.7)	9,609 (53.8)	0.038
Atrial fibrillation	660 (3.7)	631 (3.5)	0.009
Peripheral vascular disease	2,533 (14.2)	2,434 (13.6)	0.016
Chronic kidney disease	1,153 (6.5)	1,129 (6.3)	0.005
COPD	811 (4.5)	781 (4.4)	0.008
Malignancy	1,437 (8.0)	1,384 (7.8)	0.011
HF hospitalisation	626 (3.5)	595 (3.3)	0.010
Stroke	663 (3.7)	607 (3.4)	0.017
Hemodialysis	505 (2.8)	499 (2.8)	0.002
Medications before hospitalisation			
Aspirin	4,139 (23.2)	3,992 (22.4)	0.020

P2Y12 inhibitors	2,184 (12.2)	2,124 (11.9)	0.010
OAC	822 (4.6)	788 (4.4)	0.009
Strong statin	4,575 (25.6)	4,437 (24.8)	0.018
Beta blockers	2,760 (15.5)	2,698 (15.1)	0.010
RAS inhibitors	6,841 (38.3)	6,648 (37.2)	0.022
Calcium channel antagonist	7,913 (44.3)	7,694 (43.1)	0.025
Insulin	832 (4.7)	795 (4.5)	0.010
NSAIDs	2,073 (11.6)	1,993 (11.2)	0.014
PCI Procedure			
Stent implantation			
DES	15,402 (86.3)	15,433 (86.4)	0.005
BMS	246 (1.4)	243 (1.4)	0.001
DCB	1,762 (9.9)	1,665 (9.3)	0.018
POBA	16,342 (91.5)	16,385 (91.8)	0.009
Adjunctive atherectomy*	401 (2.2)	370 (2.1)	0.012
Thrombectomy	7,952 (44.5)	8,158 (45.7)	0.023
Temporary pacemaker	1,142 (6.4)	1,090 (6.1)	0.012
Fiscal year			0.039
2014–2015	4,151 (23.2)	4,220 (23.6)	
2016–2017	5,010 (28.1)	4,963 (27.8)	
2018–2019	4,770 (26.7)	4,774 (26.7)	
2020–2021	3,926 (22.0)	3,900 (21.8)	

Data are presented as numbers (%). All values are rounded after PS matching.

*Adjunctive atherectomy refers to rotational atherectomy and orbital atherectomy.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; OCT, optical coherence tomography; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors.

Supplementary Table 8. Baseline characteristics of IVUS-guided PCI versus angiography-guided PCI after PS matching.

	IVUS-guided PCI n = 31,951	Angiography-guided PCI n = 31,951	|Std Diff|
Age category			0.006
<60	5,897 (18.5)	6,247 (19.6)	
60–69	7,438 (23.3)	7,568 (23.7)	
70–79	9,883 (30.9)	9,907 (31.0)	
>80	8,733 (27.3)	8,229 (25.8)	
Female	9,032 (28.3)	8,922 (27.9)	0.008
Comorbidities/ Past medical history			
Hypertension with antihypertensive drugs	21,943 (68.7)	21,593 (67.6)	0.024
Diabetes mellitus with hypoglycemic drugs	7,968 (24.9)	7,655 (24.0)	0.023
Dyslipidemia	17,080 (53.5)	16,901 (52.9)	0.011
Atrial fibrillation	1,414 (4.4)	1,327 (4.2)	0.013
Peripheral vascular disease	4,700 (14.7)	4,468 (14.0)	0.021
Chronic kidney disease	2,419 (7.6)	2,241 (7.0)	0.021
COPD	1,403 (4.4)	1,317 (4.1)	0.013
Malignancy	2,546 (8.0)	2,407 (7.5)	0.016
HF hospitalisation	1,279 (4.0)	1,207 (3.8)	0.012
Stroke	1,362 (4.3)	1,174 (3.7)	0.030
Hemodialysis	978 (3.1)	917 (2.9)	0.011
Medications before hospitalisation			
Aspirin	7,042 (22.0)	6,843 (21.4)	0.015

P2Y12 inhibitors	2,184 (12.2)	2,124 (11.9)	0.006
OAC	822 (4.6)	788 (4.4)	0.014
Strong statin	4,575 (25.6)	4,437 (24.8)	0.019
Beta blockers	2,760 (15.5)	2,698 (15.1)	0.019
RAS inhibitors	6,841 (38.3)	6,648 (37.2)	0.017
Calcium channel antagonist	7,913 (44.3)	7,694 (43.1)	0.011
Insulin	832 (4.7)	795 (4.5)	0.011
NSAIDs	2,073 (11.6)	1,993 (11.2)	0.013
PCI Procedure			
Stent implantation			
DES	23,349 (73.1)	23,314 (73.0)	0.002
BMS	2,024 (6.3)	2,098 (6.6)	0.009
DCB	2,085 (6.5)	2,213 (6.9)	0.016
POBA	29,327 (91.8)	29,573 (92.6)	0.029
Adjunctive atherectomy*	515 (1.6)	492 (1.5)	0.006
Thrombectomy	13,648 (42.7)	14,093 (44.1)	0.028
Temporary pacemaker	2,627 (8.2)	2,568 (8.0)	0.007
Fiscal year			0.015
2014–2015	11,167 (35.0)	10,924 (34.2)	
2016–2017	9,257 (29.0)	9,380 (29.4)	
2018–2019	6,838 (21.4)	6,932 (21.7)	
2020–2021	4,689 (14.7)	4,715 (14.8)	

Data are presented as numbers (%). All values are rounded after PS matching.

*Adjunctive atherectomy refers to rotational atherectomy and orbital atherectomy.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; IVUS, intravasular ultrasound; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors.

Supplementary Table 9. Clinical outcomes (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI in patients without HF after IPTW.

	OCT- and IVUS-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
OCT-guided PCI vs Angiography-guided PCI						
Primary outcome	602/20,337	1.29 (1.16–1.44)	946/26,900	1.54 (1.44–1.65)	0.83 (0.73–0.95)	0.006
Secondary outcome	1,543/20,337	3.30 (3.05–3.57)	2,431/26,900	3.97 (3.80–4.14)	0.83 (0.76–0.90)	0.003
IVUS-guided PCI vs Angiography-guided PCI						
Primary outcome	6,263/252,251	1.13 (1.10–1.15)	858/26,745	1.45 (1.35–1.57)	0.77 (0.71–0.83)	<0.001
Secondary outcome	17,833/252,251	3.20 (3.16–3.25)	2,221/26,745	3.76 (3.59–3.94)	0.85 (0.81–0.89)	<0.001

The sensitivity analysis was performed with IPTW. Weights were generated using the baseline covariates, such as age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year.

CI, confidence interval; HF, heart failure; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.

Supplementary Table 10. Clinical outcomes (at 3 years) of OCT- and IVUS-guided PCI versus angiography-guided PCI in patients with DES implantation after IPTW.

	OCT- and IVUS-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
OCT-guided PCI vs Angiography-guided PCI						
Primary outcome	461/20,037	1.00 (0.90–1.11)	752/23,298	1.43 (1.33–1.54)	0.70 (0.62–0.79)	<0.001
Secondary outcome	1,409/20,037	3.06 (2.87–3.27)	2,201/23,298	4.17 (4.00–4.35)	0.73 (0.68–0.79)	<0.001
IVUS-guided PCI vs Angiography-guided PCI						
Primary outcome	5,992/268,313	1.02 (1.00–1.05)	694/23,333	1.37 (1.27–1.48)	0.74 (0.68–0.80)	<0.001
Secondary outcome	20,708/268,313	3.53 (3.48–3.58)	2,100/23,333	4.15 (3.97–4.34)	0.85 (0.81–0.89)	<0.001

The sensitivity analysis was performed with IPTW. Weights were generated using the baseline covariates, such as age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year.

CI, confidence interval; DES, drug-eluting stent; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.

Supplementary Table 11. Cumulative incidence of ACS recurrence by index year: imaging-guided versus angiography-guided PCI.

	Imaging-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	ARR (95% CI)
2014	1,019/28,818	1.30 (1.22–1.38)	267/5,752	1.74 (1.54–1.96)	0.75 (0.65–0.86)	0.44 (0.22–0.66)
2015	1,012/35,274	1.05 (0.98–1.11)	213/5,497	1.45 (1.27–1.66)	0.77 (0.66–0.89)	0.40 (0.19–0.61)
2016	1,084/38,546	1.02 (0.97–1.09)	188/5,011	1.41 (1.22–1.62)	0.75 (0.64–0.88)	0.39 (0.18–0.60)
2017	1,154/41,839	1.00 (0.94–1.07)	161/4,257	1.43 (1.22–1.67)	0.73 (0.61–0.86)	0.43 (0.20–0.66)
2018	1,175/43,810	0.99 (0.93–1.04)	146/3,838	1.43 (1.21–1.68)	0.71 (0.60–0.85)	0.44 (0.20–0.68)

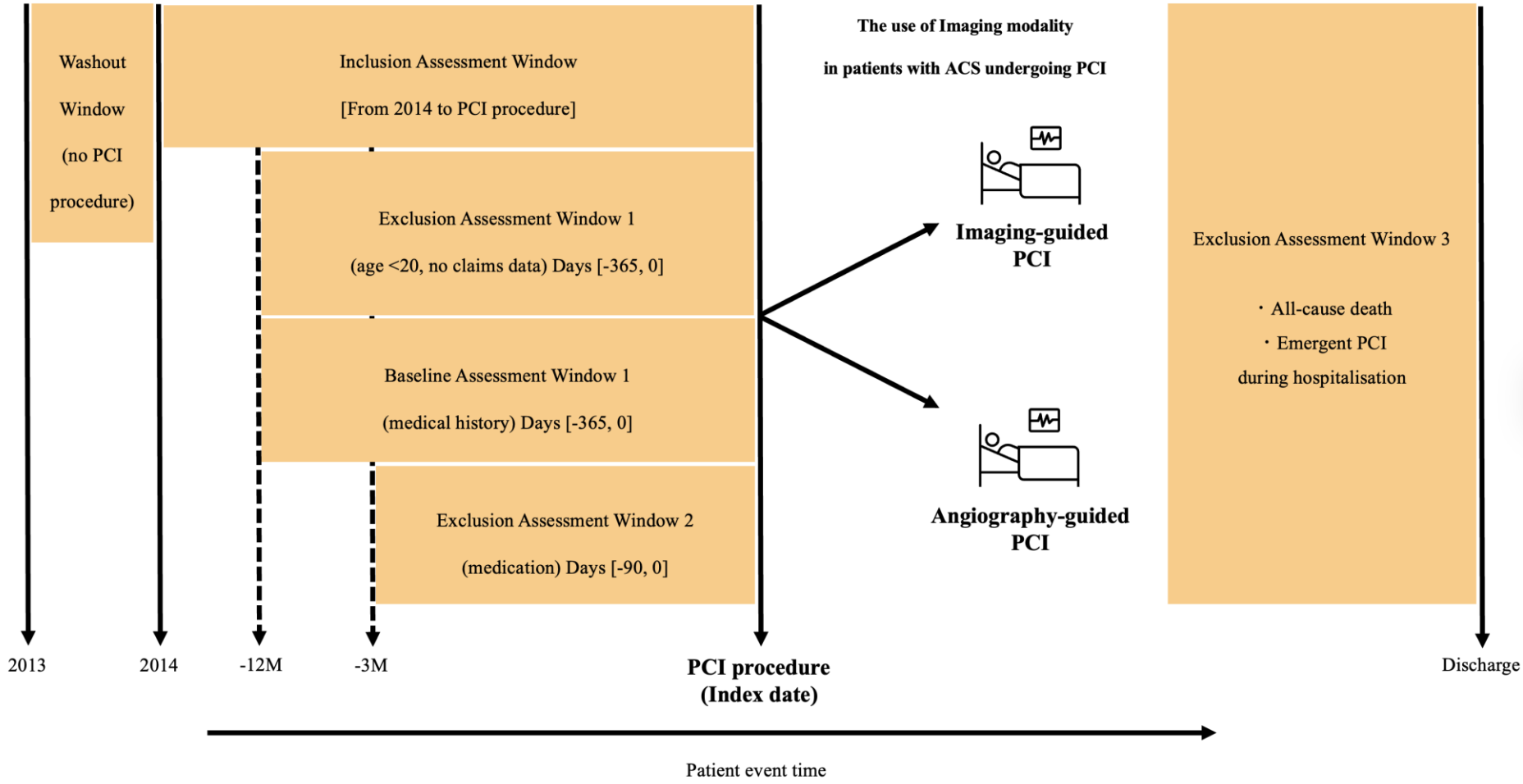
ARR, absolute risk reduction; CI, confidence interval; HR, hazard ratio; PCI, percutaneous coronary intervention.

Supplementary Table 12. Negative control outcome (hip fracture) of imaging-guided PCI versus angiography-guided PCI after IPTW.

	Imaging-guided PCI		Angiography-guided PCI			
	Total events	Incidence rate/100 person-years	Total events	Incidence rate/100 person-years	HR (95% CI)	*P*-value
Imaging-guided PCI vs Angiography-guided PCI						
Hip fracture	4,369/323,796	0.61 (0.60–0.63)	455/32,084	0.64 (0.59–0.70)	0.95 (0.86–1.05)	0.34
OCT-guided PCI vs Angiography-guided PCI						
Hip fracture	371/22,731	0.71 (0.60–0.84)	502/32,199	0.68 (0.63–0.74)	1.03 (0.85–1.25)	0.71
IVUS-guided PCI vs Angiography-guided PCI						
Hip fracture	4,062/297,979	0.62 (0.60–0.64)	460/32,053	0.62 (0.60–0.64)	0.95 (0.86–1.05)	0.32

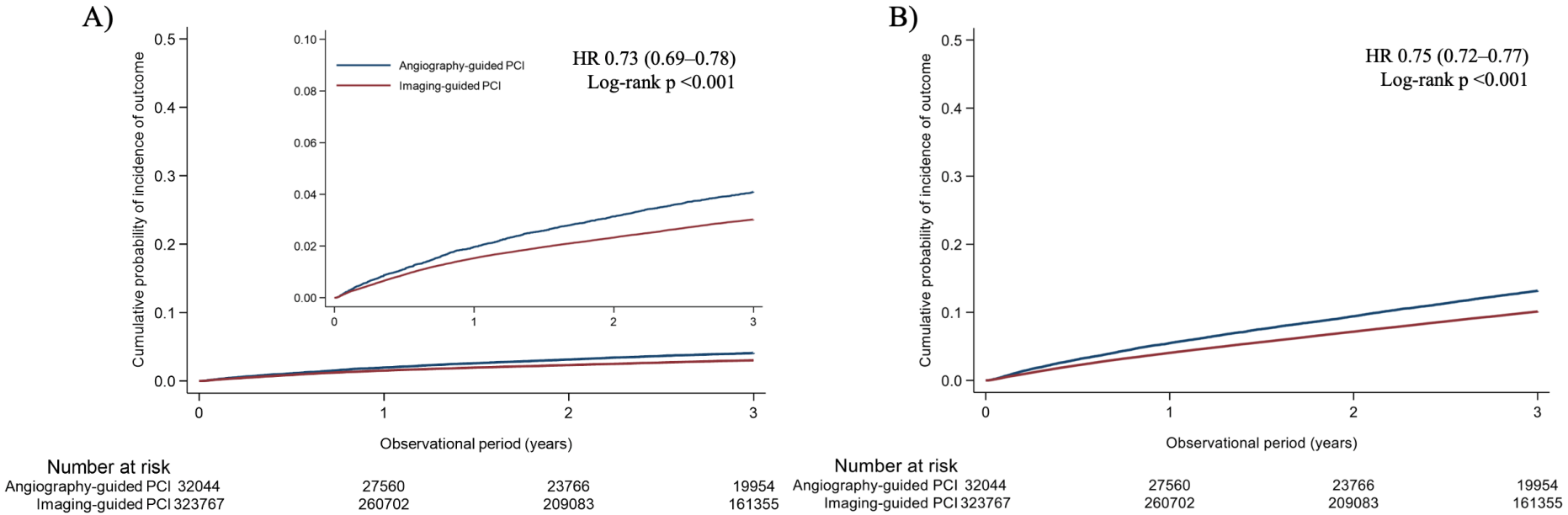
The analysis was performed with IPTW. Weights were generated using the baseline covariates, such as age, sex, comorbidities, prescribed medications, PCI procedure, and fiscal year.

CI, confidence interval; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.



Supplementary Figure 1. Study design.

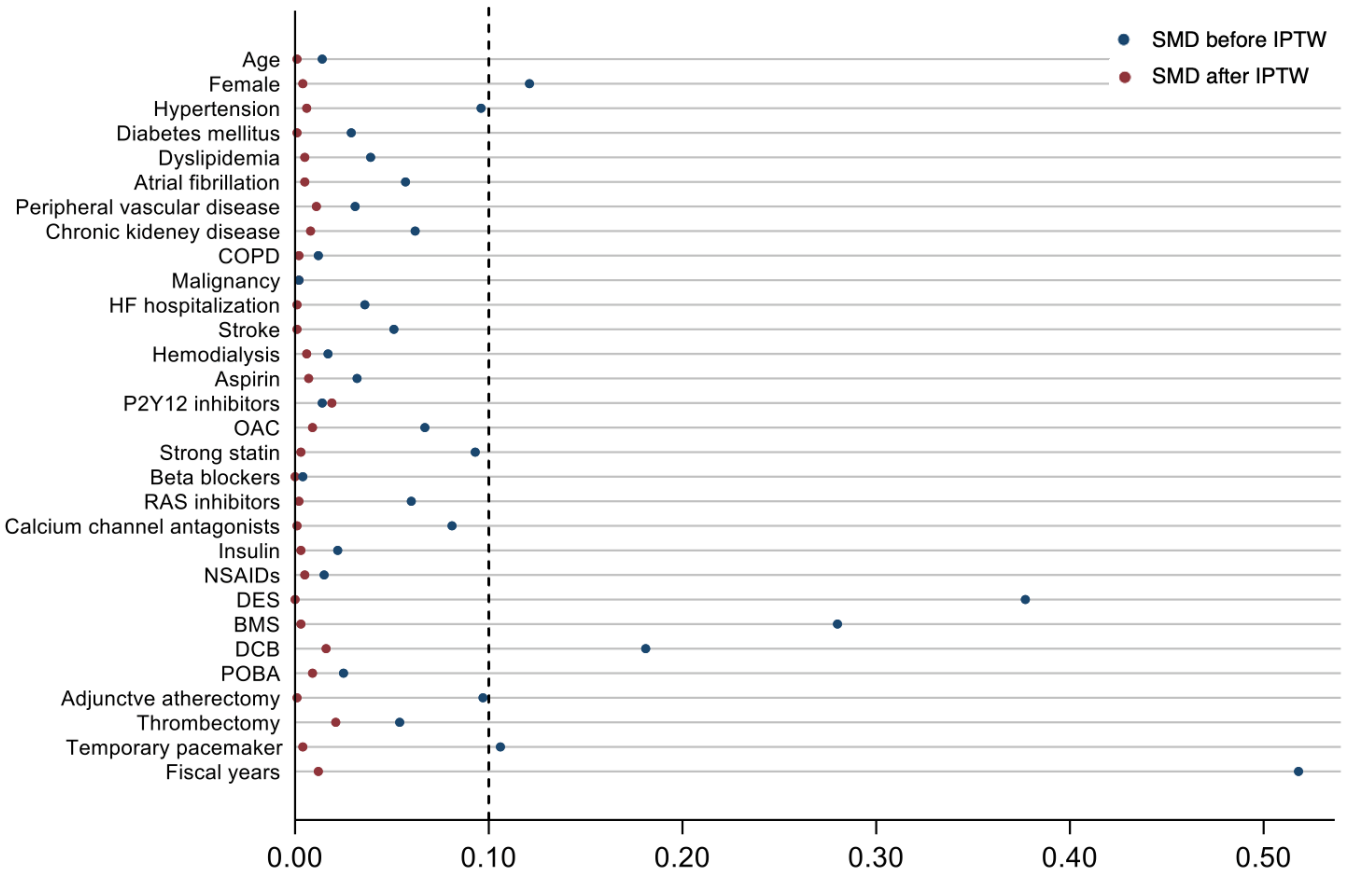
ACS, acute coronary syndrome; PCI, percutaneous coronary intervention.



Supplementary Figure 2. Crude Kaplan-Meier curves for the primary and the secondary outcomes comparing imaging-guided PCI with angiography-guided PCI.

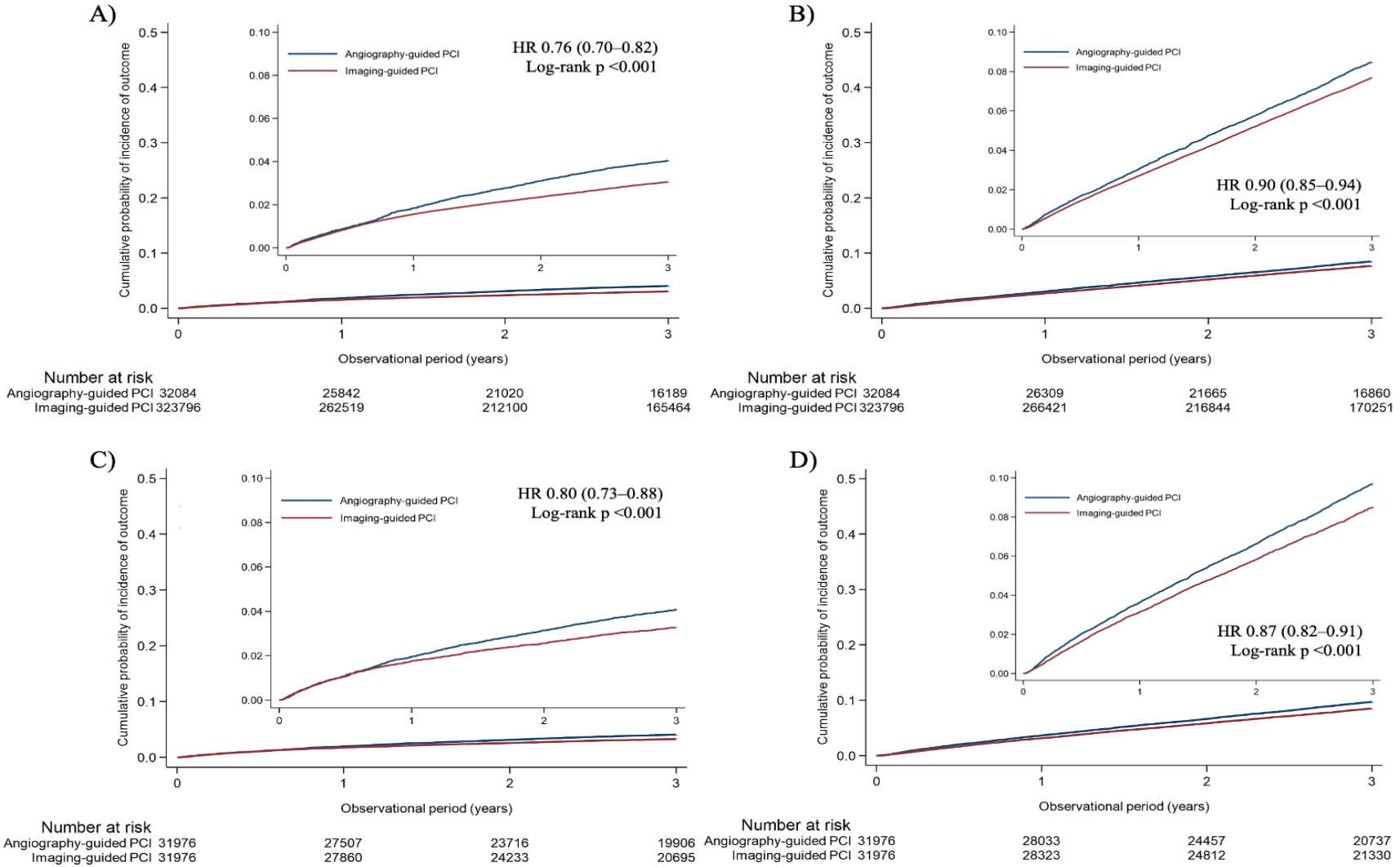
A) primary outcome (ACS recurrence), B) secondary outcome (Composite All-cause death and ACS recurrence).

ACS, acute coronary syndrome; HR, hazard ratio; PCI, percutaneous coronary intervention.



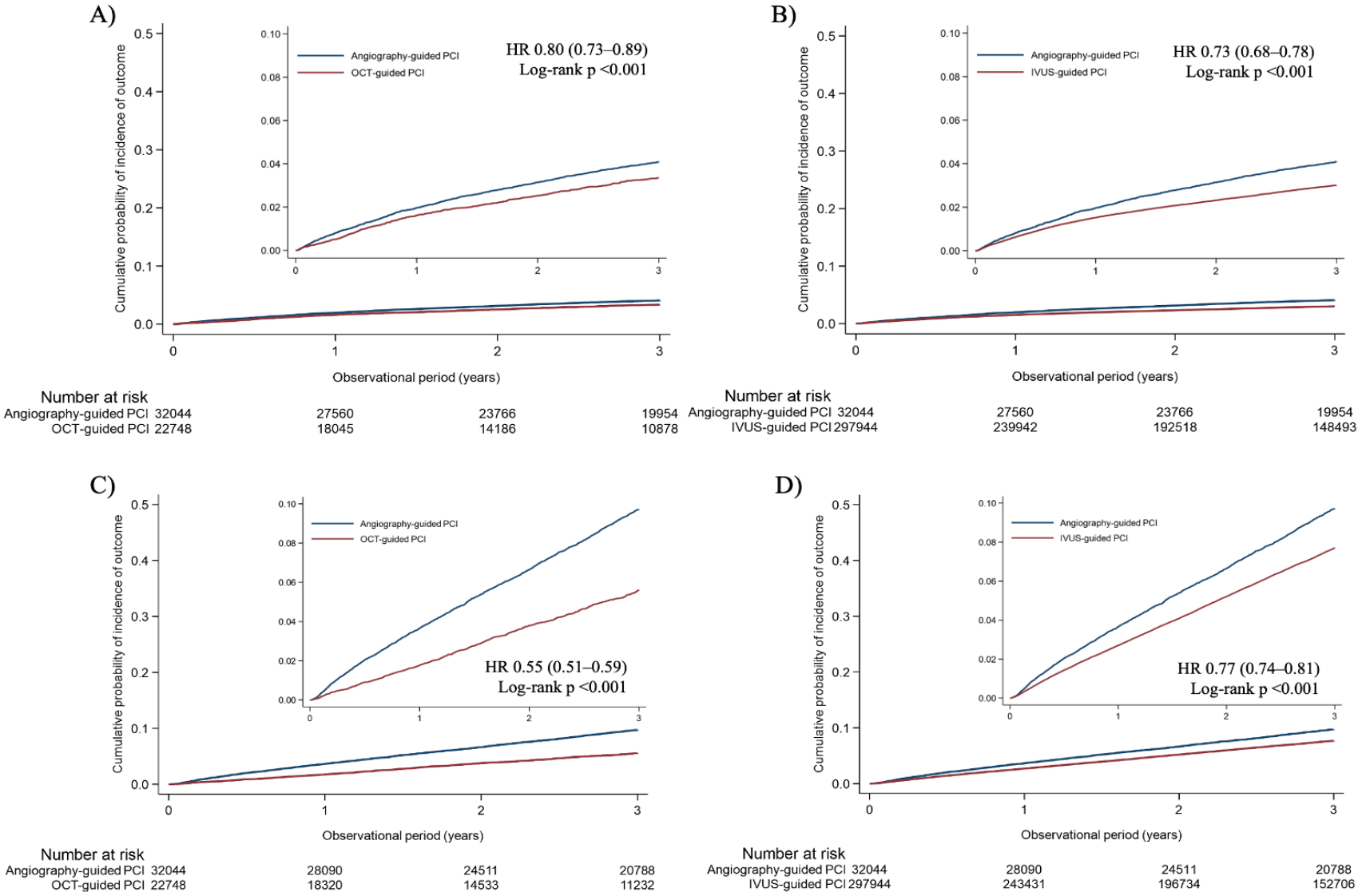
Supplementary Figure 3. Covariate balance between imaging-guided PCI and angiography-guided PCI before and after IPTW.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; IPTW, inverse probability of treatment weight; IVUS, intravascular ultrasound; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors; SMD, standard mean differences.



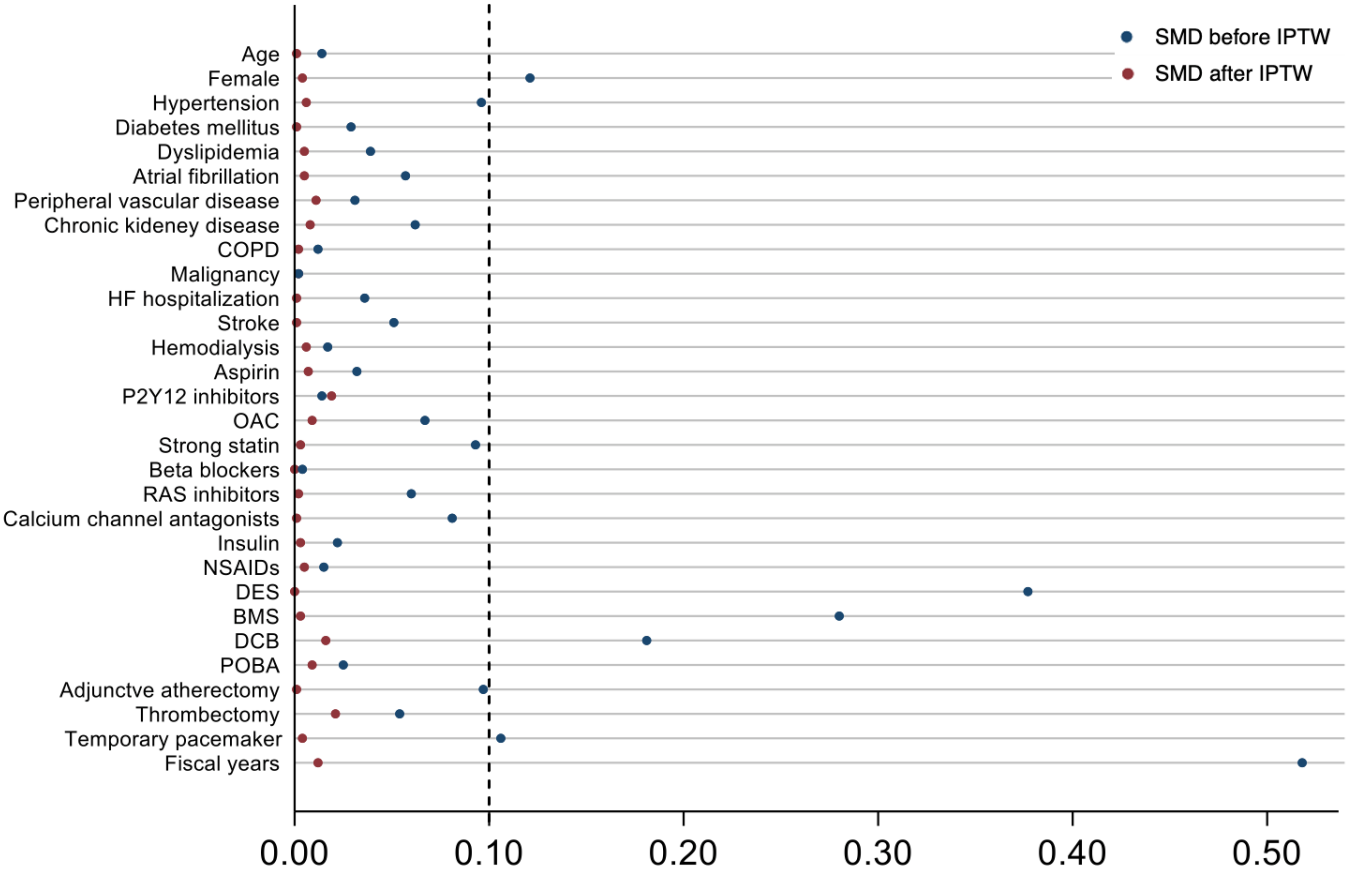
Supplementary Figure 4. Kaplan-Meier curves for the primary and secondary outcomes after IPTW and PS matching comparing imaging-guided PCI with angiography-guided PCI.

A) Imaging-guided PCI versus Angiography-guided PCI for primary outcome after IPTW, B) Imaging-guided PCI versus Angiography-guided PCI for primary outcome after IPTW, C) Imaging-guided PCI versus Angiography-guided PCI for secondary outcome after PS matching, D) Imaging-guided PCI versus Angiography-guided PCI for secondary outcome after PS matching.
HR, hazard ratio; IPTW, inverse probability of treatment weighting; PCI, percutaneous coronary intervention; PS matching, propensity score matching.



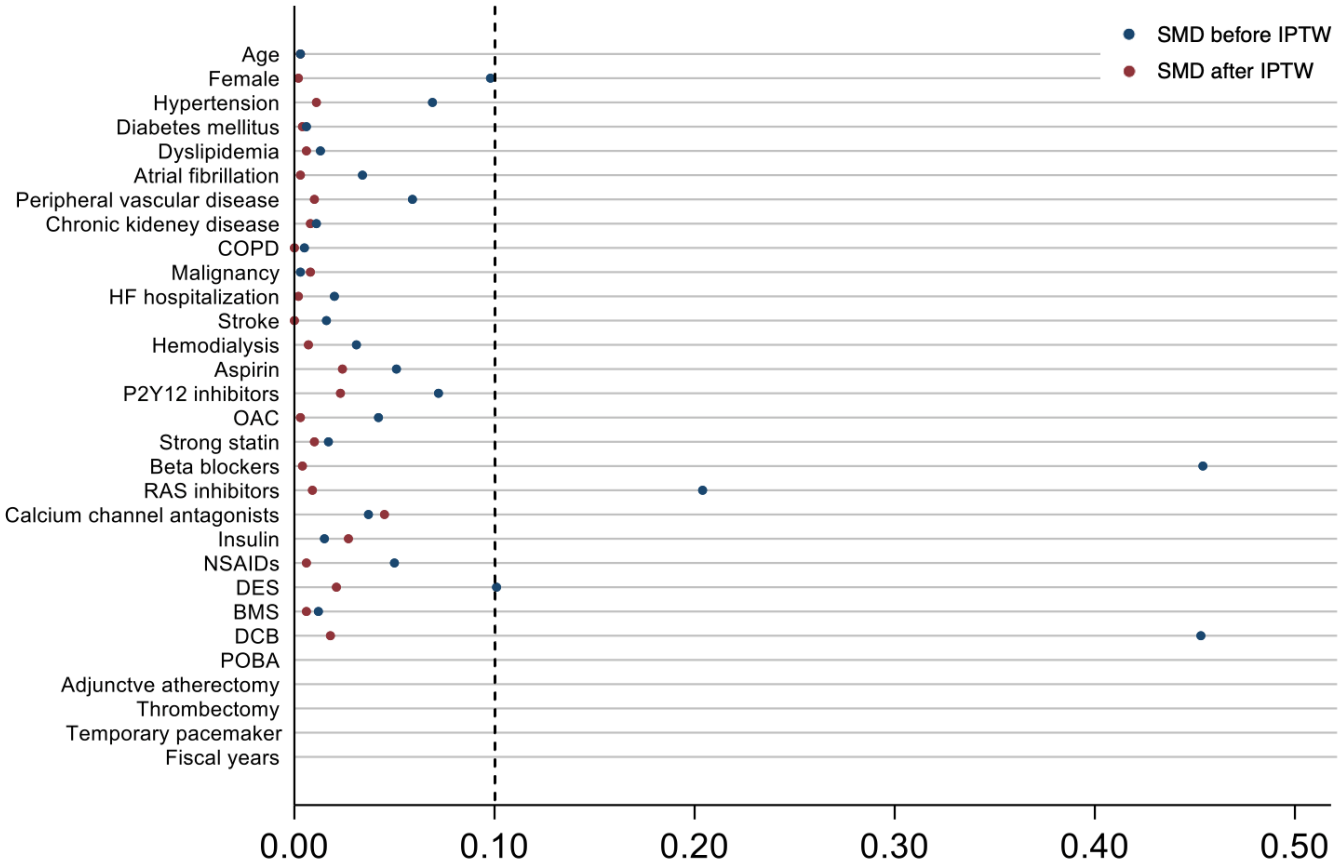
Supplementary Figure 5. Crude Kaplan-Meier curves for the primary and secondary outcomes.

A) OCT-guided PCI versus Angiography-guided PCI for primary outcome, B) IVUS-guided PCI versus Angiography-guided PCI for primary outcome, C) OCT-guided PCI versus Angiography-guided PCI for secondary outcome, D) IVUS-guided PCI versus Angiography-guided PCI for secondary outcome.
HR, hazard ratio; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.



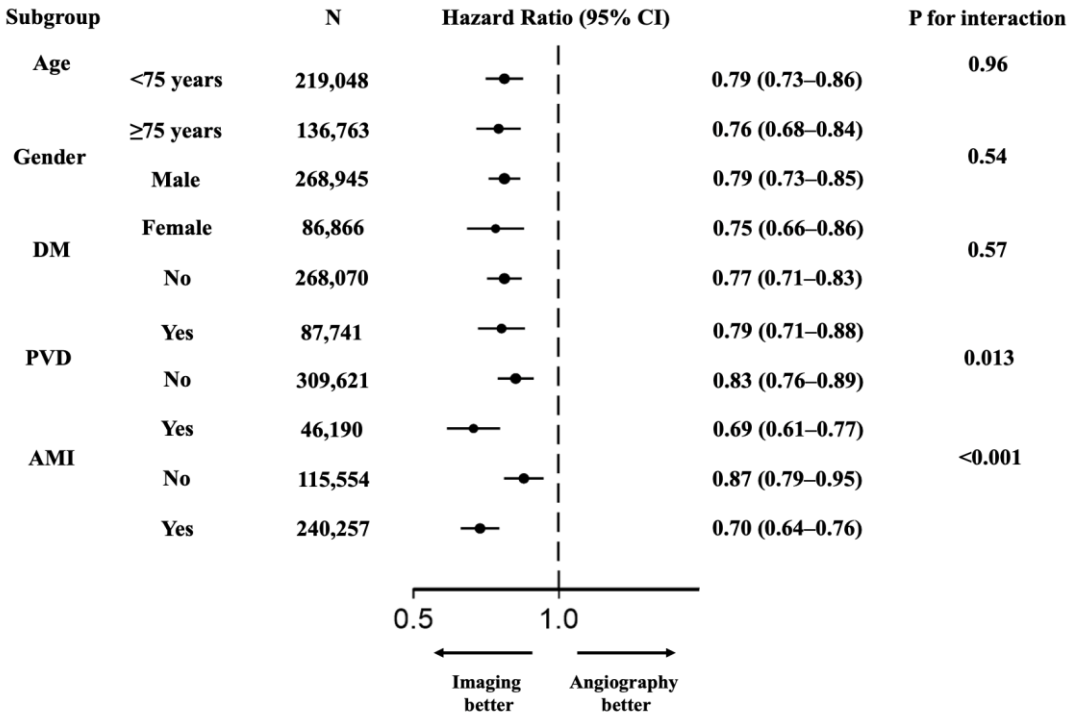
Supplementary Figure 6. Covariate balance between OCT-guided PCI and angiography-guided PCI before and after IPTW.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; IPTW, inverse probability of treatment weight; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; OCT, optical coherence tomography; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors; SMD, standard mean differences.

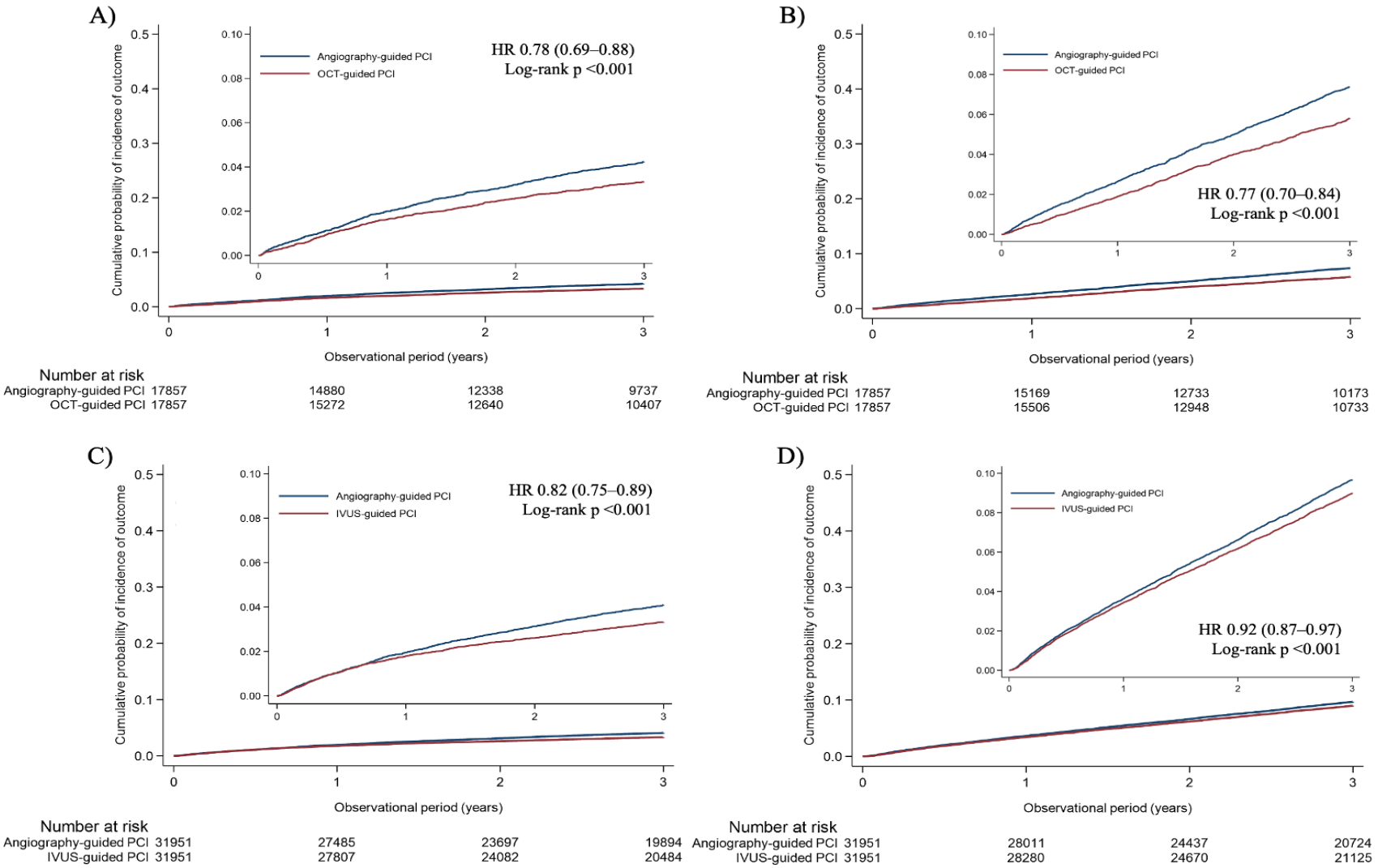


Supplementary Figure 7. Covariate balance between IVUS-guided PCI and angiography-guided PCI before and after IPTW.

BMS, bare-metal stent; COPD, chronic obstructive pulmonary disease; DCB, drug-coated balloon; DES, drug-eluting stent; HF hospitalisation, heart failure hospitalisation; IPTW, inverse probability of treatment weight; IVUS, intravascular ultrasound; NSAIDs, non-steroidal anti-inflammatory drugs; OAC, oral anticoagulant; OCT, optical coherence tomography; PCI, percutaneous coronary intervention; POBA, percutaneous old balloon angioplasty; PS matching, propensity score matching; RAS inhibitors, renin-angiotensin system inhibitors; SMD, standard mean differences.



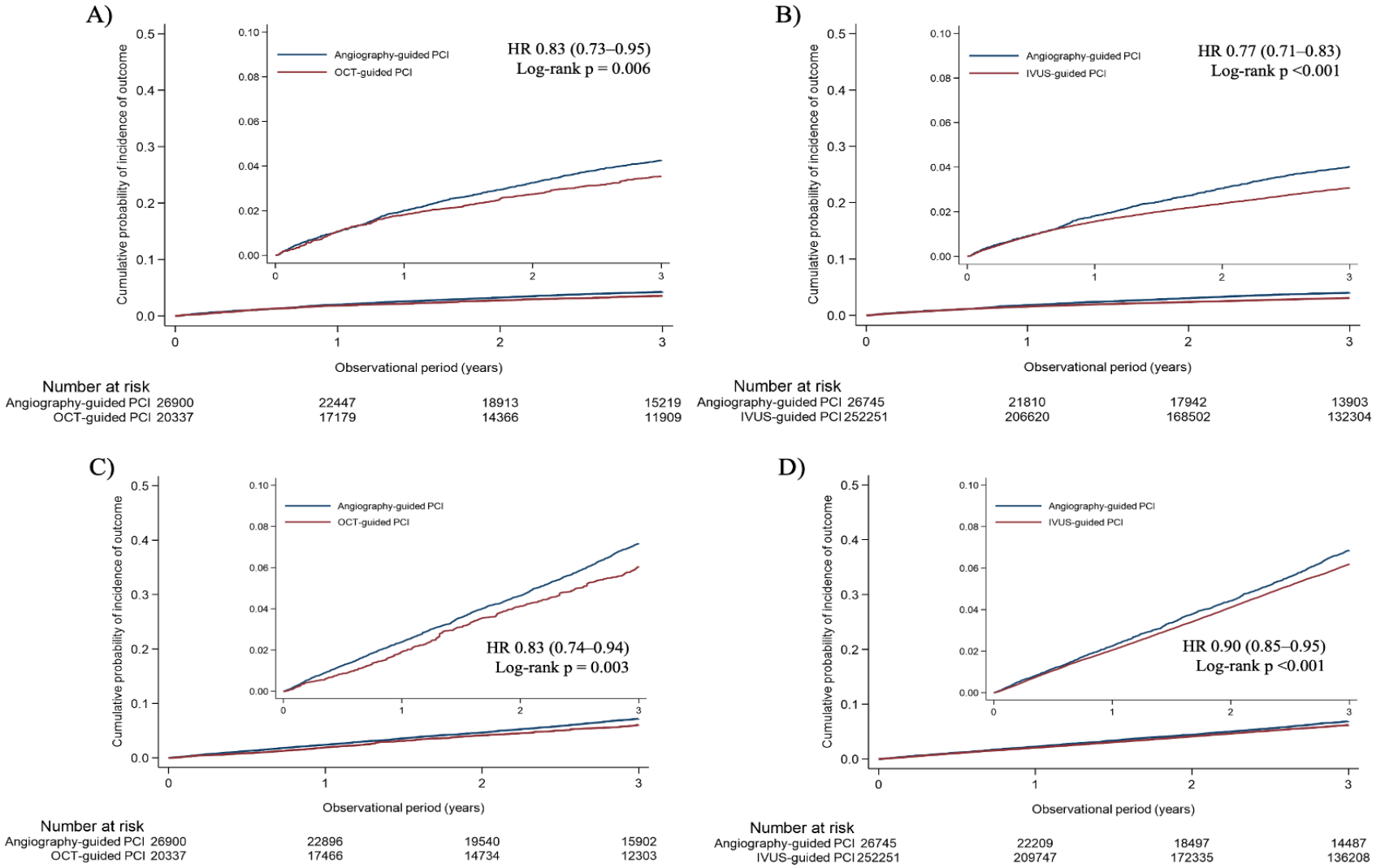
Supplementary Figure 8. Subgroup analysis of the primary outcome (ACS recurrence) using a multivariable Cox model.
This figure shows the HR of the imaging-guided PCI group as compared to the angiography-guided PCI group.
AMI, acute myocardial infarction; CI, confidence interval; DES, drug-eluting stent; DM, diabetes mellitus; HR, hazard ratio; PVD, peripheral vascular disease.



Supplementary Figure 9. Kaplan-Meier curves for the primary and secondary outcomes after PS matching, comparing OCT- and IVUS-guided PCI with angiography-guided PCI.

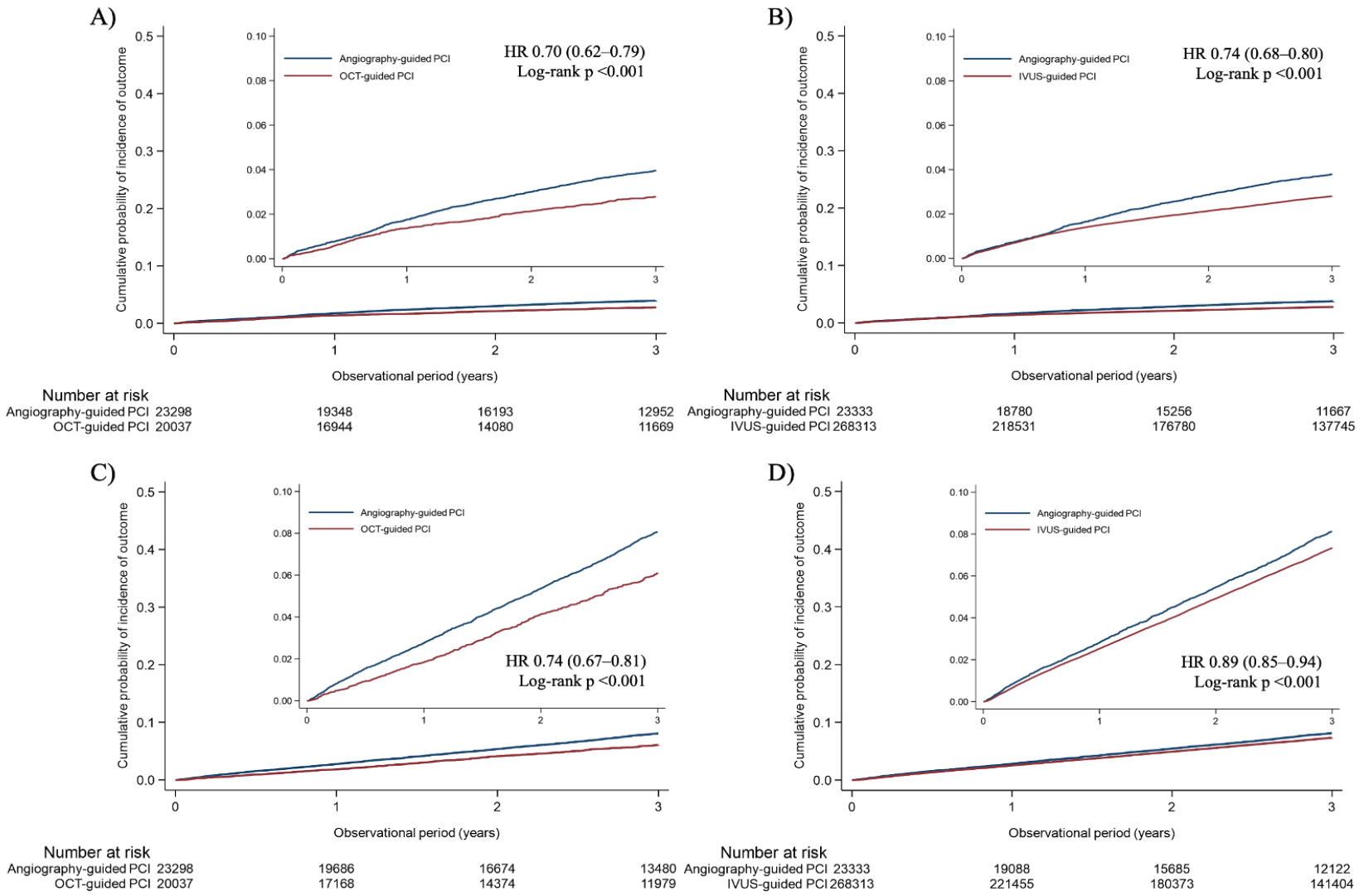
A) OCT-guided PCI versus Angiography-guided PCI for primary outcome, B) OCT-guided PCI versus Angiography-guided PCI for secondary outcome, C) IVUS-guided PCI versus Angiography-guided PCI for primary outcome, D) IVUS-guided PCI versus Angiography-guided PCI for secondary outcome.

HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.



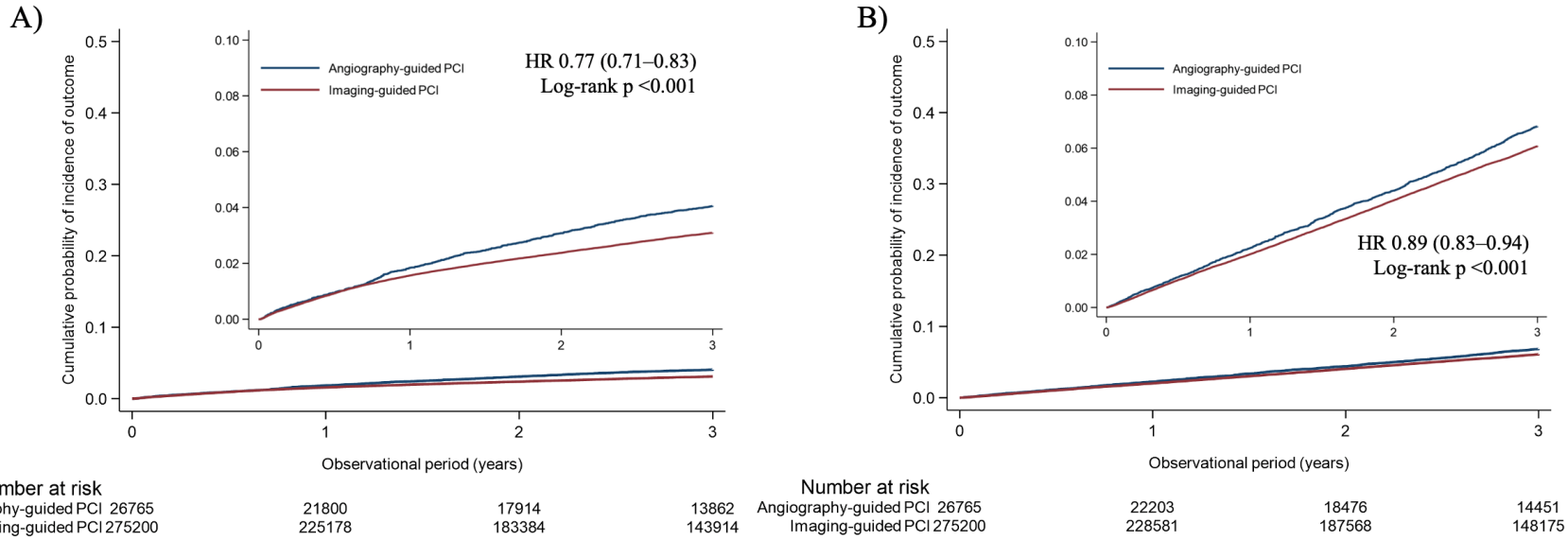
Supplementary Figure 10. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients without HF (sensitivity analysis), comparing OCT- and IVUS-guided PCI with angiography-guided PCI.

A) OCT-guided PCI versus Angiography-guided PCI for primary outcome, B) IVUS-guided PCI versus Angiography-guided PCI for primary outcome, C) OCT-guided PCI versus Angiography-guided PCI for secondary outcome, D) IVUS-guided PCI versus Angiography-guided PCI for secondary outcome.
HF, heart failure; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.



Supplementary Figure 11. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients with DES implantation (sensitivity analysis), comparing OCT- and IVUS-guided PCI with angiography-guided PCI.

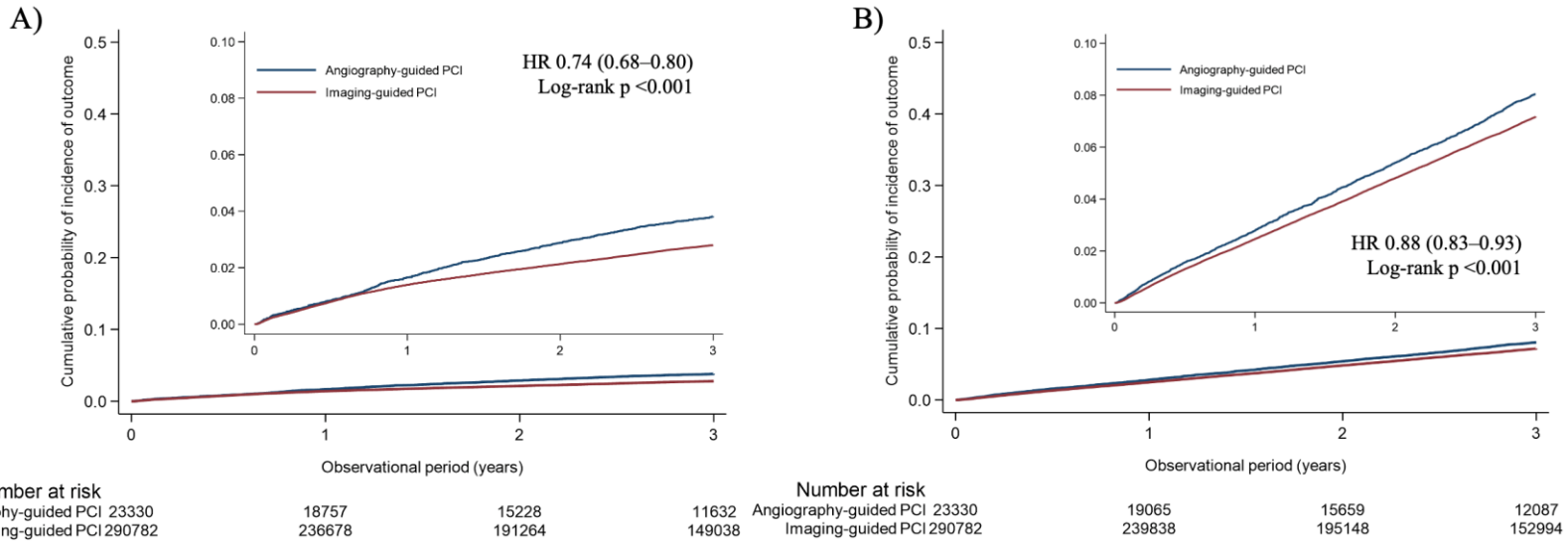
A) OCT-guided PCI versus Angiography-guided PCI for primary outcome, B) IVUS-guided PCI versus Angiography-guided PCI for primary outcome, C) OCT-guided PCI versus Angiography-guided PCI for secondary outcome, D) IVUS-guided PCI versus Angiography-guided PCI for secondary outcome.
DES, drug-eluting stent; HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.



Supplementary Figure 12. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients without HF (sensitivity analysis), comparing imaging-guided PCI with angiography-guided PCI.

A) Imaging-guided PCI versus Angiography-guided PCI for primary outcome, B) Imaging-guided PCI versus Angiography-guided PCI for secondary outcome.

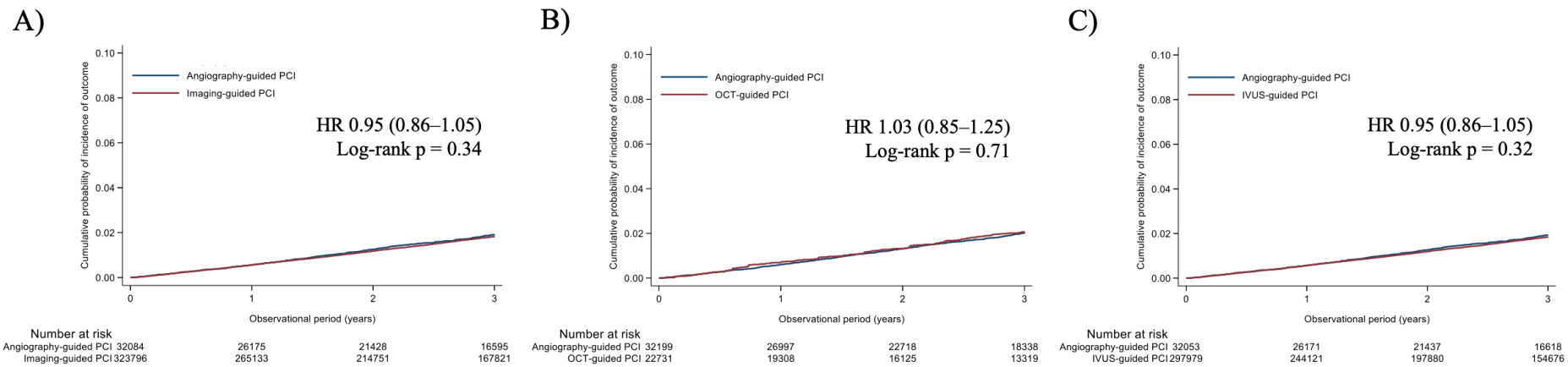
HF, heart failure; HR, hazard ratio; IPTW, inverse probability of treatment weighting; PCI, percutaneous coronary intervention.



Supplementary Figure 13. Kaplan-Meier curves for the primary and secondary outcomes after IPTW in patients with DES implantation (sensitivity analysis), comparing imaging-guided PCI with angiography-guided PCI.

A) Imaging-guided PCI versus Angiography-guided PCI for primary outcome, B) Imaging-guided PCI versus Angiography-guided PCI for secondary outcome.

DES, drug-eluting stent; HR, hazard ratio; IPTW, inverse probability of treatment weighting; PCI, percutaneous coronary intervention.



Supplementary Figure 14. Negative control outcome (hip fracture) of imaging-guided PCI versus angiography-guided PCI after IPTW.
A) Imaging-guided PCI versus Angiography-guided PCI, B) OCT-guided PCI versus Angiography-guided PCI, C) IVUS-guided PCI versus Angiography-guided PCI.
HR, hazard ratio; IPTW, inverse probability of treatment weighting; IVUS, intravascular ultrasound; OCT, optical coherence tomography; PCI, percutaneous coronary intervention.