

Antithrombotic therapy after percutaneous coronary intervention of bifurcation lesions

Marco Zimarino^{1,2*}, MD, PhD; Dominick J. Angiolillo³, MD, PhD; George Dangas⁴, MD, PhD; Davide Capodanno⁵, MD, PhD; Emanuele Barbato⁶, MD, PhD; Joo-Yong Hahn⁷, MD, PhD; Gennaro Giustino⁴, MD; Hirotoshi Watanabe⁸, MD, PhD; Francesco Costa⁹, MD, PhD; Thomas Cuisset¹⁰, MD, PhD; Roberta Rossini¹¹, MD, PhD; Dirk Sibbing¹², MD; Francesco Burzotta¹³, MD; Yves Louvard¹⁴, MD; Abdulla Shehab¹⁵, MD, PhD; Giulia Renda¹, MD, PhD; Takeshi Kimura⁸, MD, PhD; Hyeon-Cheol Gwon⁷, MD; Shao-Liang Chen¹⁶, MD, PhD; Ricardo Costa¹⁷, MD, PhD; Bon-Kwon Koo¹⁸, MD, PhD; Robert F. Storey¹⁹, MD, DM; Marco Valgimigli²⁰, MD, PhD; Roxana Mehran⁴, MD; Goran Stankovic²¹, MD, PhD

The authors' affiliations can be found in the Appendix paragraph.

GUEST EDITOR: Franz-Josef Neumann, MD; *University Heart Centre Freiburg Bad Krozingen, Division of Cardiology and Angiology II, Bad Krozingen, Germany*

This paper also includes supplementary data published online at: <https://eurointervention.pronline.com/doi/10.4244/EIJ-D-20-00648>

KEYWORDS

- adjunctive pharmacotherapy
- bifurcation
- drug-eluting stent

Abstract

Coronary bifurcations exhibit localised turbulent flow and an enhanced propensity for atherothrombosis, platelet deposition and plaque rupture. Percutaneous coronary intervention (PCI) of bifurcation lesions is associated with an increased risk of thrombotic events. Such risk is modulated by anatomical complexity, intraprocedural factors and pharmacological therapy. There is no consensus on the appropriate PCI strategy or the optimal regimen and duration of antithrombotic treatment in order to decrease the risk of ischaemic and bleeding complications in the setting of coronary bifurcation. A uniform therapeutic approach meets a clinical need. The present initiative, promoted by the European Bifurcation Club (EBC), involves opinion leaders from Europe, America, and Asia with the aim of analysing the currently available evidence. Although mainly derived from small dedicated studies, substudies of large trials or from authors' opinions, an algorithm for the optimal management of patients undergoing bifurcation PCI, developed on the basis of clinical presentation, bleeding risk, and intraprocedural strategy, is proposed here.

*Corresponding author: Institute of Cardiology, "G. d'Annunzio" University – Chieti, c/o Ospedale SS. Annunziata, Via dei Vestini, 66013 Chieti, Italy. E-mail: m.zimarino@unich.it

Abbreviations

ACS	acute coronary syndrome
CAD	coronary artery disease
DAPT	dual antiplatelet therapy
DAT	dual antithrombotic therapy
DES	drug-eluting stent(s)
DK	double kissing
EBC	European Bifurcation Club
HBR	high bleeding risk
IVUS	intravascular ultrasound
LM	left main
LOE	level of evidence
MI	myocardial infarction
MV	main vessel
OAC	oral anticoagulant
OCT	optical coherence tomography
PCI	percutaneous coronary intervention
SB	side branch
ST	stent thrombosis
TAT	triple antithrombotic therapy
TVR	target vessel revascularisation

Introduction

Dual antiplatelet therapy (DAPT) with aspirin and a P2Y₁₂ receptor inhibitor (clopidogrel, prasugrel, or ticagrelor) is the standard of care for patients undergoing percutaneous coronary intervention (PCI) with drug-eluting stents (DES)^{1,2}. However, the optimal duration of DAPT remains a topic of debate³, particularly in complex lesions.

Patients with a coronary bifurcation account for 15-20% of candidates to PCI and are at higher risk of both periprocedural and long-term adverse events⁴. Coronary artery bifurcation lesions exhibit localised turbulent flow and an enhanced propensity for platelet aggregation, plaque rupture, and atherothrombosis. Anatomical factors, including the fractal geometry of vascular bifurcations, increase the incidence of strut malapposition and stent underexpansion. Definite or probable stent thrombosis (ST) occurs more frequently early (within the first 30 days) rather than late. The overall incidence of ST in bifurcation PCI is in the range of 1.5-2%, almost double as compared to non-bifurcation PCI (<1%)⁴. The risk varies according to bifurcation complexity, as ST occurs in about 2% when side branch (SB) lesion length is >10 mm, and 1% for SB lesion length <10 mm⁵, and procedural technique, with two stents showing a doubled risk of ST as compared to a single-stent technique⁶.

The term “bifurcation lesion” encompasses a large variety of anatomic subsets and clinical scenarios, from left main (LM) bifurcation with a significant amount of myocardium at risk to a small branching lateral branch with negligible myocardium at risk. Such anatomic subsets, both listed in the “complex bifurcation lesion” classification of the DEFINITION II study⁷ (**Supplementary Table 1**), show thrombotic and ischaemic risks pointing in different directions, therefore hindering the identification of the optimal antithrombotic therapy.

The European Bifurcation Club (EBC) recommends single stenting with the “provisional” side branch (SB) stenting strategy for the treatment of the vast majority of bifurcation lesions⁶, while European Society of Cardiology (ESC) guidelines “suggest considering” the use of double stenting with the double kissing (DK-) crush technique in the treatment of LM bifurcation lesions (class IIb, level of evidence [LOE] B), following the results of the DKCRUSH-V trial⁸.

In any event, careful planning is absolutely mandatory in bifurcation PCI, as a “bail-out” placement of a second stent has been associated with higher risk of ST than planned double stenting^{9,10}.

In the two-stent strategy, the EBC recommends final kissing balloon inflation followed by the proximal optimisation technique (POT) in order to minimise strut malapposition and subsequent ST risk⁶. Intravascular guidance represents a valuable strategy in bifurcation PCI: ESC guidelines recommend intravascular ultrasound (IVUS) guidance only for the treatment of unprotected LM lesions (class IIa, LOE B)¹¹, while the EBC underlines the benefit of intravascular imaging for any bifurcation⁶ (**Figure 1**).

Therefore, the implementation of individualised antithrombotic management to mitigate the risk of ST and spontaneous myocardial infarction (MI) without a concurrent increased risk of bleeding according to the procedural complexity in PCI bifurcation answers a clinical need.

The EBC suggested a state-of-the-art paper on antithrombotic therapy after bifurcation PCI. The document chairs (M. Zimarino and D.J. Angiolillo) identified key opinion leaders from Europe, America, and Asia with expertise in basic, translational, and clinical sciences in the field of antiplatelet therapy and interventional cardiology.

In this manuscript, specific issues related to antithrombotic therapy after PCI of bifurcation lesions are presented. For further details please refer to **Supplementary Appendix 1**.

CHOICE OF ANTITHROMBOTIC DRUGS AND TIMING OF INITIATION

In acute coronary syndrome (ACS) patients, potent oral P2Y₁₂ inhibitors (prasugrel and ticagrelor) are recommended in the light of their superior efficacy when compared to clopidogrel². As compared to clopidogrel, ticagrelor¹² and prasugrel¹³ were associated with a similar (1.0% and 1.2%, respectively) absolute reduction of ST in ACS patients, which was higher (3.2% after prasugrel) in the cohort of patients with a bifurcation stent¹³. Following the results of the ISAR-REACT 5 trial¹⁴, ESC guidelines¹⁵ now give a preference to prasugrel over ticagrelor in patients who proceed to PCI (class IIa).

Although the efficacy of newer P2Y₁₂ inhibitors over clopidogrel has never been documented in stable coronary artery disease (CAD), the authors agree with the ESC guidelines, where prasugrel and ticagrelor may be considered (class IIb) in patients with stable CAD and a high risk of thrombosis, such as complex LM cases, based on expert consensus (LOE C)¹⁶.

With ST occurring mostly in the acute and early phase, rapid and effective i.v. inhibition of the platelet P2Y₁₂ receptor may be

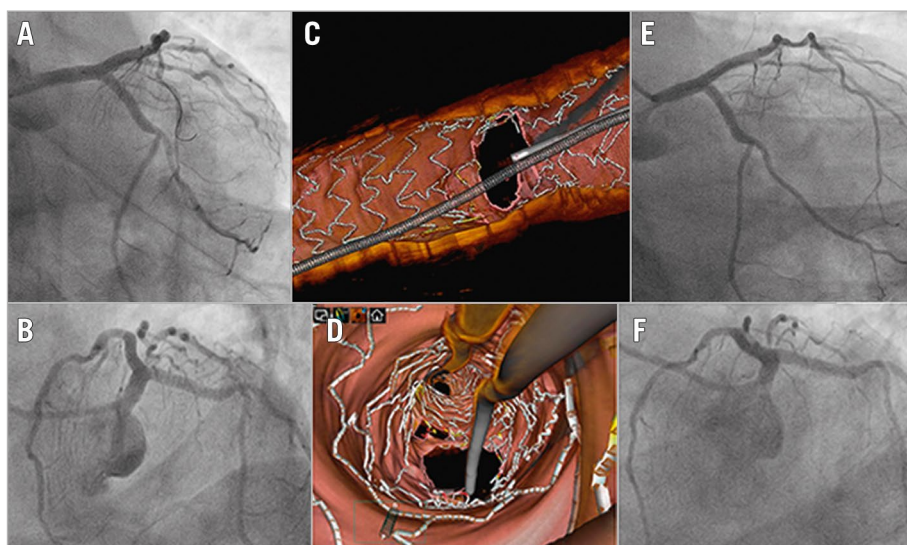


Figure 1. OCT assessment of LM bifurcation stenting. After double stenting of the left main (LM) with the culotte technique (A & B), 3D optical coherence tomography (OCT) documented adequate stent expansion without strut protrusion (C & D). The patient remained asymptomatic and, 12 months later, the stents were widely patent at control angiography (E & F).

adopted in patients undergoing bifurcation PCI without adequate pretreatment. A substudy of the CHAMPION-PHOENIX trial reported that the number of high-risk lesions (a coronary bifurcation was present in almost 50% of cases) was strongly predictive of periprocedural MI and ST and cangrelor significantly reduced such adverse events, with a greater absolute effect proportional to the number of high-risk lesions, irrespective of clinical presentation¹⁷.

DAPT DURATION AND RISK STRATIFICATION

International guidelines list coronary bifurcation as a risk factor for ST (among other characteristics of PCI complexity), suggesting that a longer duration of DAPT for both stable CAD and ACS may be considered in this setting (class IIb, LOE B)^{1,2}.

This recommendation is based mainly on a meta-analysis¹⁸ (**Table 1**) where, as compared with 3-6 months, ≥ 12 months DAPT duration was associated with a significant reduction in the composite endpoint among patients who underwent “complex” PCI – defined according to the so-called “Giustino criteria” – but not in the non-complex PCI group ($p_{\text{interaction}} = 0.01$). The presence of a bifurcation treated with double stenting was the strongest risk factor for the composite of cardiac death, MI or ST, and its individual components. Long-term DAPT was associated with an increased risk for major bleeding, regardless of PCI complexity.

Given the trade-off between ischaemic and bleeding risks for any DAPT duration, three scoring systems have been developed (**Supplementary Table 2**).

A substudy of the DAPT trial¹⁹ (**Table 1**) documented that, among subjects with anatomic complexity (19% double stenting for bifurcation), those with a DAPT score ≥ 2 receiving 30-month DAPT experienced a significantly lower rate of MI or ST (3.0%)

than those receiving only 12-month DAPT (6.1%, $p < 0.001$), while no difference was detected among patients with a score < 2 .

In a sub-analysis of the PRECISE-DAPT pooled data set²⁰ (**Table 1**), patients who underwent a complex PCI, based on the Giustino criteria¹⁸, experienced a risk reduction (-4%) in the composite net adverse clinical events from long-term DAPT only if the bleeding risk at baseline was low (PRECISE-DAPT score < 25). When receiving long-term DAPT, patients at high baseline bleeding risk (PRECISE-DAPT score ≥ 25) experienced no significant risk reduction for ischaemic events regardless of the complexity of PCI and suffered a significant excess of bleeding complications ($p_{\text{int}} = 0.89$).

The greatest benefit of prolonged DAPT is accrued in bifurcation PCI with a larger thrombogenic milieu (ACS, double stenting, no imaging) and higher ischaemic risk (large myocardium at risk, as for unprotected LM); in this setting, a thorough evaluation of the bleeding risk becomes crucial.

THE IDENTIFICATION OF PATIENTS AT HIGH BLEEDING RISK

The concept of “high bleeding risk” (HBR) has recently been emphasised to guide DAPT duration in patients undergoing PCI².

The Academic Research Consortium (ARC)-HBR initiative recently issued a consensus²¹ identifying HBR patients as those with a one-year risk of a Bleeding Academic Research Consortium (BARC)-defined type 3 or 5 bleeding of $\geq 4\%$ and of intracranial haemorrhage of $\geq 1\%$. According to twenty clinical major or minor criteria (**Supplementary Table 3**), patients are identified as being at HBR if at least one major criterion or two minor criteria are met.

In the context of bifurcation PCI, the identification of HBR should be an argument to favour a procedural strategy – single “provisional” stenting, intravascular guidance – that allows a shorter DAPT duration.

Table 1. Studies assessing the impact of DAPT duration after PCI of bifurcation lesions.

	Giustino et al ¹⁸	Yeh et al ¹⁹	Jang et al ³²	Rhee et al ³³	Zimarino et al ¹⁰	Kogame et al ²²	Costa et al ²⁰	Dangas et al ²³
Year	2016	2017	2018	2018	2019	2019	2019	2020
Type of study	Pooled analysis from 6 RCTs	Substudy of an RCT	nROS	Pooled analysis from 5 nROS	nROS	Substudy of an RCT	Pooled analysis from RCTs	Substudy of an RCT
Name of the original study	–	DAPT	COBIS II	–	EBC registry	GLOBAL LEADERS	PRECISE-DAPT	TWILIGHT COMPLEX
Study population	n=9,577	n=11,554	n=2,082	n=700	n=5,036	n=15,845	n=14,963	n=2,342
Bifurcation lesions	6.8%	6.2%	100%	100%	100%	15.8%	8%	10.7%
2-stent	100%	100%	26%	19%	10%	20%	100%	100%
DAPT duration	3-6 months	12 months	<12 months	<12 months	<6 months SCAD,	1 month (then ticagrelor)	3-6 months	3 months
Short-term	≥12 months	30 months	≥12 months	≥12 months	<12 months ACS	12 months (then aspirin)	12-24 months	15 months
Long-term					≥6 months SCAD			
					≥12 months ACS			
Follow-up	13 months	30 months	4 years	3 years	18 months	2 years	2 years	18 months
Efficacy endpoint	MACE (cardiac death, MI, or ST)	MI or ST	Death or MI	MACE (cardiac death, MI, or ST)	MACE (cardiac death, MI, or ST)	Death or MI	MI, ST, stroke, TVR	Death, MI, stroke
Safety endpoint	Major bleeding	Moderate/severe bleeding	NA	NA	NA	Major bleeding	Major and minor bleeding	BARC 3 or 5 bleeding
Main findings	Long-term DAPT reduces the risk of MACE in the complex PCI group, increases the risk of major bleeding	Long-term DAPT increases the risk of bleeding and reduces MI or ST, most evident among complex PCI with DAPT score ≥2	After PS matching, the risk of death or MI was lower in the long- vs short-term DAPT group	After PS matching, the risk of MACE in the 2-stent group was lower with long- vs short-term DAPT	Long-term DAPT was associated with a lower risk of MACE	No differences in death or MI. No differences in bleeding risk	Long-term DAPT reduces the risk of ischaemic events in complex PCI only if PRECISE-DAPT score <25.	Long-term DAPT increased the risk of bleeding and is associated with a trend towards a reduction in risk of death, MI or stroke

MACE: major adverse cardiac events; NA: not available; nROS: non-randomised observational study; PS: propensity score; RCT: randomised clinical trial; TVR: target vessel revascularisation

ROLE OF P2Y₁₂-RECEPTOR INHIBITOR MONOTHERAPY

Against the tenet of P2Y₁₂ inhibitor discontinuation on a background of continued aspirin, there has been growing interest in the concept of discontinuing aspirin in favour of monotherapy with a sole P2Y₁₂ inhibitor, aiming to contain the bleeding risk.

In the GLOBAL LEADERS trial, among patients who underwent bifurcation PCI (16%) with a biolimus-eluting stent (**Table 1**), one month of DAPT followed by ticagrelor monotherapy for 23 months was associated with a similar risk of two-year all-cause death or MI, without any significant reduction in the bleeding risk when compared with 12-month DAPT followed by aspirin²².

In the TWILIGHT-COMPLEX substudy²³ (**Table 1**), this approach was specifically evaluated among patients who underwent “complex” PCI, with two-stent bifurcation being used in 10.7% of cases. Ticagrelor monotherapy was associated with a similar and consistent reduction in the BARC 2, 3 or 5 bleeding risk in both the “complex” and “non-complex” PCI groups, without increasing the risk of ischaemic events.

A recent meta-analysis documented that ST was infrequent, and aspirin discontinuation was not associated with a statistically significant increase in the risk²⁴. However, such an appealing strategy still needs confirmation in the bifurcation setting.

SWITCHING OR DISCONTINUATION OF P2Y₁₂ INHIBITORS

In general, escalation – an increase in platelet inhibition – may be indicated in the early phase after a complex PCI²⁵. The presence of

high-risk angiographic characteristics, namely thrombotic, long, and bifurcating lesions, has been identified as the major determinant of escalation from clopidogrel to prasugrel in clinical practice²⁶.

De-escalation – the transition from a more potent P2Y₁₂ inhibitor – is the most common of the switching strategies, given that thrombotic events are more likely to occur early and the prolonged use of potent P2Y₁₂ inhibition is associated with an increased risk of bleeding with less enhanced antithrombotic benefit²⁵. It comes into the clinical field when you have, for example, a high-risk lesion such as in bifurcation stenting but at the same time an HBR on ticagrelor or prasugrel.

Premature discontinuation of oral antiplatelet therapy after PCI is associated with a significant increase in the risk of ischaemic events and ST²⁷, with non-cardiac surgery representing one of the most common causes.

Following the Surgery After Stenting 2 document²⁸, bridging with an intravenous antiplatelet agent, such as cangrelor at a dose regimen of 0.75 mcg/kg/min, may be recommended in patients deemed to be at high thrombotic risk, such as those with bifurcation lesions treated with double stenting, who cannot safely interrupt oral antiplatelet therapy.

MANAGEMENT OF CANDIDATES FOR ORAL ANTICOAGULATION

A recent meta-analysis²⁹ underlined that, in candidates for oral anticoagulant (OAC) therapy after PCI, a dual antithrombotic

therapy (DAT) with OAC and a single antiplatelet agent is associated with a reduction of bleeding as compared with triple antithrombotic therapy (TAT, i.e., OAC in combination with DAPT) (risk ratio [RR] 0.66, 95% CI: 0.56-0.78; $p < 0.0001$); non-vitamin K (N)OAC-based DAT versus vitamin K antagonist TAT yielded consistent results and a significant reduction of intracranial haemorrhage (RR 0.33, 95% CI: 0.17-0.65; $p = 0.001$). Such benefit is, however, counterbalanced by a significant increase of ST (RR 1.59, 95% CI: 1.01-2.50; $p = 0.04$) and a trend towards higher risk of MI with DAT as compared with TAT.

Substudies on complex lesions from both the PIONEER AF-PCI trial³⁰ and the REDUAL PCI trial³¹ showed that NOAC-based DAT following PCI was associated with a reduced bleeding and a similar thrombotic risk compared with warfarin-based TAT, irrespective of the complexity of PCI.

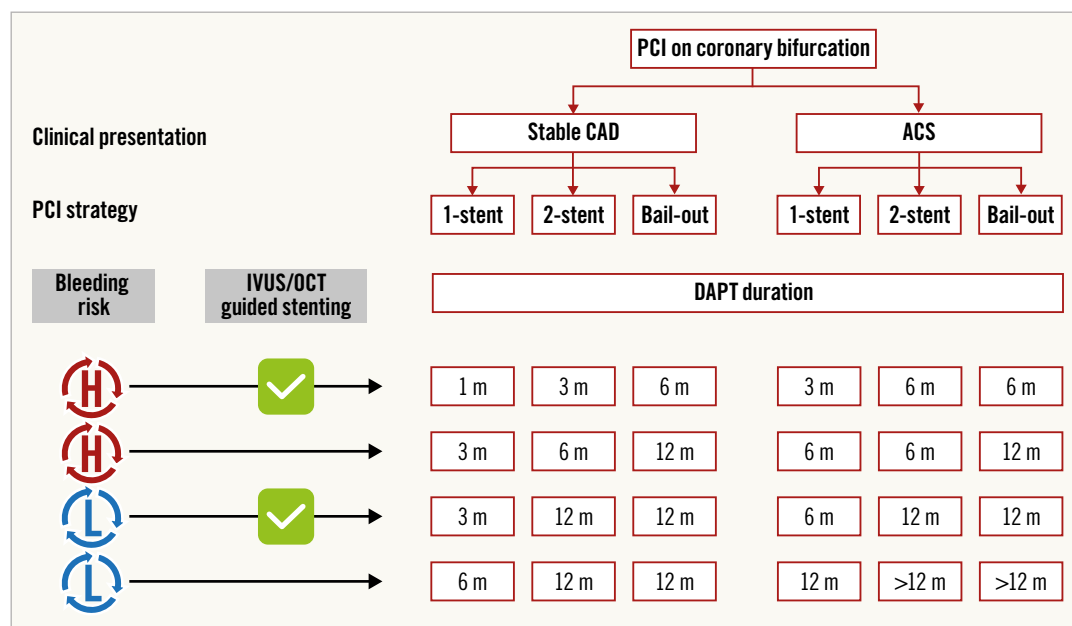
Conclusions

The selection and the duration of antithrombotic therapy after bifurcation PCI should take into account multiple factors. Although we acknowledge that much of the currently available evidence about antithrombotic therapy in bifurcation PCI is not derived from major dedicated studies, we here propose a decision-making algorithm for DAPT duration based primarily on the clinical presentation, the baseline bleeding risk, the stenting strategy, and the possible use of intracoronary imaging in patients not candidates to anticoagulant therapy (**Central illustration**).

Strategy trials are keenly awaited to refine further the optimal antithrombotic regimen in patients undergoing bifurcation PCI.

Appendix. Authors' affiliations

1. Institute of Cardiology, University "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy; 2. Cath Lab, SS. Annunziata Hospital, ASL2 Abruzzo, Chieti, Italy; 3. Division of Cardiology, University of Florida College of Medicine, Jacksonville, FL, USA; 4. The Zena and Michael A. Wiener Cardiovascular Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA; 5. Cardio-Thoracic-Vascular Department, Centro Alte Specialità e Trapianti, Catania, and Azienda Ospedaliero Universitario "Vittorio Emanuele-Policlinico", University of Catania, Catania, Italy; 6. Department of Advanced Biomedical Sciences, Federico II University of Naples, Naples, Italy; 7. Heart Vascular Stroke Institute, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea; 8. Department of Cardiovascular Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan; 9. Department of Clinical and Experimental Medicine, Policlinic "G Martino", University of Messina, Messina, Italy; 10. Department of Cardiology, CHU Timone, Marseille, France; 11. Cardiology, Ospedale Santa Croce e Carle, Cuneo, Italy; 12. Privatlinik Lauterbacher Mühle am Ostersee, Iffeldorf, and Department of Cardiology, Ludwig-Maximilians-University (LMU) München, Munich, Germany; 13. Department of Cardiovascular Sciences, Fondazione Policlinico Universitario A. Gemelli IRCCS, Università Cattolica del Sacro Cuore, Rome, Italy; 14. Ramsay Générale de Santé - Institut Cardiovasculaire Paris Sud, Hôpital Privé Jacques Cartier, Massy, France; 15. Department of Internal Medicine, College of Medicine and Health Sciences, UAE University, Al Ain, Abu Dhabi, United Arab Emirates; 16. Nanjing First Hospital, Nanjing Medical University, Nanjing, China; 17. Istituto Dante Pazzanese de Cardiologia,



Central illustration. Strategy algorithm proposal for DAPT duration after PCI of bifurcation in patients not candidates for oral anticoagulation. ACS: acute coronary syndrome; CAD: coronary artery disease; DS: double stenting; IVUS: intravascular ultrasound; OCT: optical coherence tomography; PCI: percutaneous coronary intervention; SS: single stenting

Sao Paulo, SP, Brazil; 18. Department of Internal Medicine and Cardiovascular Center, Seoul National University Hospital, Seoul, Republic of Korea; 19. Cardiovascular Research Unit, Department of Infection Immunity and Cardiovascular Disease, University of Sheffield, Sheffield, United Kingdom; 20. Bern University Hospital, Bern, Switzerland; 21. Department of Cardiology, Clinical Center of Serbia, and Medical Faculty, University of Belgrade, Belgrade, Serbia

Guest Editor

This paper was guest edited by Franz-Josef Neumann, MD; University Heart Centre Freiburg Bad Krozingen, Division of Cardiology and Angiology II, Bad Krozingen, Germany.

Conflict of interest statement

D.J. Angiolillo declares that he has received consulting fees or honoraria from Amgen, Aralez, AstraZeneca, Bayer, Biosensors, Boehringer Ingelheim, Bristol-Myers Squibb, Chiesi, Daiichi Sankyo, Eli Lilly, Haemonetics, Janssen, Merck, PhaseBio, PLx Pharma, Pfizer, Sanofi, and The Medicines Company and has received payments for participation in review activities from CeloNova and St. Jude Medical. D.J. Angiolillo also declares that his institution has received research grants from Amgen, AstraZeneca, Bayer, Biosensors, CeloNova, CSL Behring, Daiichi Sankyo, Eisai, Eli Lilly, Gilead, Idorsia, Janssen, Matsutani Chemical Industry Co., Merck, Novartis, Osprey Medical, Renal Guard Solutions, and the Scott R. MacKenzie Foundation. G. Dangas declares that he has received consulting fees from Abbott Vascular, Boston Scientific and Biosensors, reports common stock (entirely divested) from Medtronic and declares that his institution has received institutional payments for research grants from AstraZeneca, Bayer and Daiichi Sankyo. D. Capodanno reports personal fees from Abbott Vascular, Amgen, Bayer, Biosensors, Daiichi Sankyo, Sanofi Aventis, Pfizer, and AstraZeneca. E. Barbato reports speaker's fees from Abbott Vascular, Boston Scientific and GE. G. Renda reports speaker and consulting fees from Bayer, BMS-Pfizer, Boehringer Ingelheim, and Daiichi Sankyo. R.F. Storey declares personal fees and institutional research grants from AstraZeneca, GlyCardial Diagnostics and Thromboserin, and personal fees from Amgen, Bayer, Bristol Myers Squibb/Pfizer, Haemonetics, Medscape, and Portola. M. Valgimigli reports personal fees from AstraZeneca, Alvimedica/CID, Abbott Vascular, Daiichi Sankyo, Opsens, Bayer, CoreFlow, Idorsia Pharmaceuticals Ltd, Universität Basel | Dept. Klinische Forschung, Vifor, Bristol Myers Squibb SA, iVascular and Medscape, and grants and personal fees from Terumo. R. Mehran has received consulting fees from Abbott Vascular, Boston Scientific, Medscape/WebMD, Siemens Medical Solutions, Philips/Volcano/Spectranetics, Roivant Sciences, Sanofi Italy, Bracco Group, Janssen, and AstraZeneca; has received grant support, paid to her institution, from Bayer, CSL Behring, DSI, Medtronic, Novartis Pharmaceuticals, OrbusNeich, Osprey Medical, PLC/RenalGuard, and Abbott Vascular; has received grant support and advisory board fees, paid to her institution, from Bristol-Myers Squibb; has received fees for serving on a data and safety monitoring board from Watermark Research Funding; has received advisory

fees and lecture fees from Medintelligence (Janssen); and has received lecture fees from Bayer. The other authors have no conflicts of interest to declare. The Guest Editor reports lecture fees paid to his institution from Amgen, Bayer Healthcare, Biotronik, Boehringer Ingelheim, Boston Scientific, Daiichi Sankyo, Edwards Lifesciences, Ferrer, Pfizer, and Novartis, consultancy fees paid to his institution from Boehringer Ingelheim, and grant support from Bayer Healthcare, Boston Scientific, Biotronik, Edwards Lifesciences, GlaxoSmithKline, Medtronic, and Pfizer.

References

- Levine GN, Bates ER, Bittl JA, Brindis RG, Fihn SD, Fleisher LA, Granger CB, Lange RA, Mack MJ, Mauri L, Mehran R, Mukherjee D, Newby LK, O'Gara PT, Sabatine MS, Smith PK, Smith SC Jr. 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2016;68:1082-115.
- Valgimigli M, Bueno H, Byrne RA, Collet JP, Costa F, Jeppsson A, Jüni P, Kastrati A, Kolh P, Mauri L, Montalescot G, Neumann FJ, Petricevic M, Roffi M, Steg PG, Windecker S, Zamorano JL, Levine GN; ESC Scientific Document Group; ESC Committee for Practice Guidelines (CPG); ESC National Cardiac Societies. 2017 ESC focused update on dual antiplatelet therapy in coronary artery disease developed in collaboration with EACTS: The Task Force for dual antiplatelet therapy in coronary artery disease of the European Society of Cardiology (ESC) and of the European Association for Cardio-Thoracic Surgery (EACTS). *Eur Heart J*. 2018;39:213-60.
- Zimarino M, Renda G, De Caterina R. Optimal duration of antiplatelet therapy in recipients of coronary drug-eluting stents. *Drugs*. 2005;65:725-32.
- Grundecken MJ, Wyrzykowska JJ, Ishibashi Y, Garg S, de Vries T, Garcia-Garcia HM, Onuma Y, de Winter RJ, Buszman P, Linke A, Ischinger T, Klaus V, Eberli F, Corti R, Wijns W, Morice MC, di Mario C, Meier B, Jüni P, Yazdani A, Copt S, Windecker S, Serruys PW. First generation versus second generation drug-eluting stents for the treatment of bifurcations: 5-year follow-up of the LEADERS all-comers randomized trial. *Catheter Cardiovasc Interv*. 2016;87:E248-60.
- Zimarino M, Barbato E, Nakamura S, Radico F, Di Nicola M, Briguori C, Gil RJ, Kanic V, Perfetti M, Pellicano M, Mairic K, Stankovic G; European Bifurcation Club. The impact of the extent of side branch disease on outcomes following bifurcation stenting. *Catheter Cardiovasc Interv*. 2020;96:E84-92.
- Burzotta F, Lassen J, Lefèvre T, Banning A, Chatzizisis Y, Johnson T, Ferenc M, Rathore S, Albiero R, Pan M, Darremont O, Hildick-Smith D, Chieffo A, Zimarino M, Louvard Y, Stankovic G. Percutaneous coronary intervention for bifurcation coronary lesions: the 15th consensus document from the European Bifurcation Club. *EuroIntervention*. 2021;16:1307-17.
- Zhang JJ, Ye F, Xu K, Kan J, Tao L, Santoso T, Munawar M, Tresukosol D, Li L, Sheiban I, Li F, Tian NL, Rodriguez AE, Paiboon C, Lavarra F, Lu S, Vichairuangthum K, Zeng H, Chen L, Zhang R, Ding S, Gao F, Jin Z, Hong L, Ma L, Wen S, Wu X, Yang S, Yin WH, Zhang J, Wang Y, Zheng Y, Zhou L, Zhou L, Zhu Y, Xu T, Wang X, Qu H, Tian Y, Lin S, Liu L, Lu Q, Li Q, Li B, Jiang Q, Han L, Gan G, Yu M, Pan D, Shang Z, Zhao Y, Liu Z, Yuan Y, Chen C, Stone GW, Han Y, Chen SL. Multicentre, randomized comparison of two-stent and provisional stenting techniques in patients with complex coronary bifurcation lesions: the DEFINITION II trial. *Eur Heart J*. 2020;41:2523-36.
- Chen SL, Zhang JJ, Han Y, Kan J, Chen L, Qiu C, Jiang T, Tao L, Zeng H, Li L, Xia Y, Gao C, Santoso T, Paiboon C, Wang Y, Kwan TW, Ye F, Tian N, Liu Z, Lin S, Lu C, Wen S, Hong L, Zhang Q, Sheiban I, Xu Y, Wang L, Rab TS, Li Z, Cheng G, Cui L, Leon MB, Stone GW. Double Kissing Crush Versus Provisional Stenting for Left Main Distal Bifurcation Lesions: DKCRUSH-V Randomized Trial. *J Am Coll Cardiol*. 2017;70:2605-17.
- Burzotta F, Summaria F, Latib A, De Vita M, Fantoni C, Benedetto S, Turturo M, Larosa C, Manzoli A, Trani C. Prospective multicentre clinical performance evaluation of second and third generation zotarolimus-eluting stents to treat patients with bifurcated coronary lesions. *Catheter Cardiovasc Interv*. 2016;87:15-22.
- Zimarino M, Briguori C, Amat-Santos IJ, Radico F, Barbato E, Chieffo A, Cirillo P, Costa RA, Erglis A, Gama H, Gil RJ, Kanic V, Kedev SA, Maddestra N, Nakamura S, Pellicano M, Petrov I, Strozzi M, Tesorio T, Vukcevic V, De Caterina R, Stankovic G; EuroBifurcation Club. Mid-term outcomes after percutaneous interventions in coronary bifurcations. *Int J Cardiol*. 2019;283:78-83.
- Neumann FJ, Sousa-Uva M, Ahlsson A, Alfonso F, Banning AP, Benedetto U, Byrne RA, Collet JP, Falk V, Head SJ, Jüni P, Kastrati A, Koller A, Kristensen SD, Niebauer J, Richter DJ, Seferovic PM, Sibbing D, Stefanini GG, Windecker S,

- Yadav R, Zembala MO; ESC Scientific Document Group. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J*. 2019;40:87-165.
12. Cannon CP, Harrington RA, James S, Ardissino D, Becker RC, Emanuelsson H, Husted S, Katus H, Keltai M, Khurmi NS, Kontny F, Lewis BS, Steg PG, Storey RF, Wojdyla D, Wallentin L; PLATelet inhibition and patient Outcomes Investigators. Comparison of ticagrelor with clopidogrel in patients with a planned invasive strategy for acute coronary syndromes (PLATO): a randomised double-blind study. *Lancet*. 2010;375:283-93.
 13. Wiviott SD, Braunwald E, McCabe CH, Horvath I, Keltai M, Herrman JP, Van de Werf F, Downey WE, Scirica BM, Murphy SA, Antman EM; TRITON-TIMI 38 Investigators. Intensive oral antiplatelet therapy for reduction of ischaemic events including stent thrombosis in patients with acute coronary syndromes treated with percutaneous coronary intervention and stenting in the TRITON-TIMI 38 trial: a subanalysis of a randomised trial. *Lancet*. 2008;371:1353-63.
 14. Schüpke S, Neumann FJ, Menichelli M, Mayer K, Bernlochner I, Wöhrle J, Richardt G, Liebetrau C, Witzenbichler B, Antoniucci D, Akin I, Bott-Flügel L, Fischer M, Landmesser U, Katus HA, Sibbing D, Seyfarth M, Janisch M, Boncompagni D, Hilz R, Rottbauer W, Okrojek R, Möllmann H, Hochholzer W, Migliorini A, Cassese S, Mollo P, Xhepa E, Kufner S, Strehle A, Leggewie S, Allali A, Ndrepepa G, Schühlen H, Angiolillo DJ, Hamm CW, Hapfelmeier A, Tölg R, Trenk D, Schunkert H, Laugwitz KL, Kastrati A; ISAR-REACT 5 Trial Investigators. Ticagrelor or Prasugrel in Patients with Acute Coronary Syndromes. *N Engl J Med*. 2019;381:1524-34.
 15. Collet JP, Thiele H, Barbato E, Barthélémy O, Bauersachs J, Bhatt DL, Dendale P, Dorobantu M, Edvardsen T, Folliguet T, Gale CP, Gilard M, Jobs A, Jüni P, Lambrinou E, Lewis BS, Mehilli J, Meliga E, Merkely B, Mueller C, Roffi M, Rutten FH, Sibbing D, Siontis GCM; ESC Scientific Document Group. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur Heart J*. 2021;42:1289-367.
 16. Knuuti J, Wijns W, Saraste A, Capodanno D, Barbato E, Funck-Brentano C, Prescott E, Storey RF, Deaton C, Cuisset T, Agewall S, Dickstein K, Edvardsen T, Escaned J, Gersh BJ, Svtil P, Gilard M, Hasdai D, Hatala R, Mahfoud F, Masip J, Muneretto C, Valgimigli M, Achenbach S, Bax JJ; ESC Scientific Document Group. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. *Eur Heart J*. 2020;41:407-77.
 17. Stone GW, Généreux P, Harrington RA, White HD, Gibson CM, Steg PG, Hamm CW, Mahaffey KW, Price MJ, Prats J, Deliargyris EN, Bhatt DL. Impact of lesion complexity on peri-procedural adverse events and the benefit of potent intravenous platelet adenosine diphosphate receptor inhibition after percutaneous coronary intervention: core laboratory analysis from 10 854 patients from the CHAMPION PHOENIX trial. *Eur Heart J*. 2018;39:4112-21.
 18. Giustino G, Chieffo A, Palmerini T, Valgimigli M, Feres F, Abizaid A, Costa RA, Hong MK, Kim BK, Jang Y, Kim HS, Park KW, Gilard M, Morice MC, Sawaya F, Sardella G, Genereux P, Redfors B, Leon MB, Bhatt DL, Stone GW, Colombo A. Efficacy and Safety of Dual Antiplatelet Therapy After Complex PCI. *J Am Coll Cardiol*. 2016;68:1851-64.
 19. Yeh RW, Kereiakes DJ, Steg PG, Cutlip DE, Croce KJ, Massaro JM, Mauri L; DAPT Study Investigators. Lesion Complexity and Outcomes of Extended Dual Antiplatelet Therapy After Percutaneous Coronary Intervention. *J Am Coll Cardiol*. 2017;70:2213-23.
 20. Costa F, Van Klaveren D, Feres F, James S, Räber L, Pilgrim T, Hong MK, Kim HS, Colombo A, Steg PG, Bhatt DL, Stone GW, Windecker S, Steyerberg EW, Valgimigli M; PRECISE-DAPT Study Investigators. Dual Antiplatelet Therapy Duration Based on Ischemic and Bleeding Risks After Coronary Stenting. *J Am Coll Cardiol*. 2019;73:741-54.
 21. Urban P, Mehran R, Collieran R, Angiolillo DJ, Byrne RA, Capodanno D, Cuisset T, Cutlip D, Eerdmans P, Eikelboom J, Farb A, Gibson CM, Gregson J, Haude M, James SK, Kim HS, Kimura T, Konishi A, Laschinger J, Leon MB, Magee PFA, Mitsutake Y, Mylotte D, Pocock S, Price MJ, Rao SV, Spitzer E, Stockbridge N, Valgimigli M, Varenne O, Windhoevel U, Yeh RW, Krucoff MW, Morice MC. Defining high bleeding risk in patients undergoing percutaneous coronary intervention: a consensus document from the Academic Research Consortium for High Bleeding Risk. *Eur Heart J*. 2019;40:2632-53.
 22. Kogame N, Chichareon P, De Wilder K, Takahashi K, Modolo R, Chang CC, Tomaniak M, Komiya H, Chieffo A, Colombo A, Garg S, Louvard Y, Jüni P, Steg PG, Hamm C, Vranckx P, Valgimigli M, Windecker S, Stoll HP, Onuma Y, Janssens L, Serruys PW. Clinical relevance of ticagrelor monotherapy following 1-month dual antiplatelet therapy after bifurcation percutaneous coronary intervention: Insight from GLOBAL LEADERS trial. *Catheter Cardiovasc Interv*. 2020;96:100-11.
 23. Dangas G, Baber U, Sharma S, Giustino G, Mehta S, Cohen D, Angiolillo D, Sartori S, Chandiramani R, Briguori C, Dudek D, Escaned J, Huber K, Collier T, Kornowski R, Kunadian V, Kaul U, Oldroyd K, Sardella G, Shlofmitz R, Witzenbichler B, Ya-Ling H, Pocock S, Gibson CM, Mehran R. Ticagrelor With Aspirin or Alone After Complex PCI: The TWILIGHT-COMPLEX Analysis. *J Am Coll Cardiol*. 2020;75:2414-24.
 24. O'Donoghue ML, Murphy SA, Sabatine MS. The Safety and Efficacy of Aspirin Discontinuation on a Background of a P2Y12 Inhibitor in Patients after Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis. *Circulation*. 2020;142:538-45.
 25. Angiolillo DJ, Rollini F, Storey RF, Bhatt DL, James S, Schneider DJ, Sibbing D, So DYF, Trenk D, Alexopoulos D, Gurbel PA, Hochholzer W, De Luca L, Bonello L, Aradi D, Cuisset T, Tantry US, Wang TY, Valgimigli M, Waksman R, Mehran R, Montalescot G, Franchi F, Price MJ. International Expert Consensus on Switching Platelet P2Y12 Receptor-Inhibiting Therapies. *Circulation*. 2017;136:1955-75.
 26. Bagai A, Wang Y, Wang TY, Curtis JP, Gurm HS, Shah B, Cheema AN, Peterson ED, Saucedo JF, Granger CB, Roe MT, Bhatt DL, McNamara RL, Alexander KP. In-hospital switching between clopidogrel and prasugrel among patients with acute myocardial infarction treated with percutaneous coronary intervention: insights into contemporary practice from the national cardiovascular data registry. *Circ Cardiovasc Interv*. 2014;7:585-93.
 27. Mehran R, Baber U, Steg PG, Ariti C, Weisz G, Witzenbichler B, Henry TD, Kini AS, Stuckey T, Cohen DJ, Berger PB, Iakovou I, Dangas G, Waksman R, Antoniucci D, Sartori S, Krucoff MW, Hermiller JB, Shawl F, Gibson CM, Chieffo A, Alu M, Moliterno DJ, Colombo A, Pocock S. Cessation of dual antiplatelet treatment and cardiac events after percutaneous coronary intervention (PARIS): 2 year results from a prospective observational study. *Lancet*. 2013;382:1714-22.
 28. Rossini R, Tarantini G, Musumeci G, Masiero G, Barbato E, Calabro P, Capodanno D, Leonardi S, Lettino M, Limbruno U, Menozzi A, Marchese UOA, Saia F, Valgimigli M, Ageno W, Falanga A, Corcione A, Locatelli A, Montorsi M, Piazza D, Stella A, Bozzani A, Parolari A, Carone R, Angiolillo DJ; Italian Society of Interventional Cardiology (SICI-GISE); Italian Society for the Study of Haemostasis and Thrombosis (SISST); Italian Society of Anesthesia and Intensive Care Medicine (SIAARTI); Italian Society of Surgery (SIC); Italian Society for Cardiac Surgery (SICCH); Italian Society of Vascular and Endovascular Surgery (SICVE); Italian Society of Urology (SIU); Italian Orthopaedic Society (SIOT); Italian Society of Thoracic Surgeons (SICT); Italian Federation of Scientific Societies of Digestive System Diseases (FISMAD); Italian Society of Digestive Endoscopy (SIED); Italian Association of Hospital Gastroenterology and Digestive Endoscopy (AIGO); Italian Association of Gastroenterology and Digestive Endoscopy (SIGE); Italian Society of Maxillofacial Surgery (SICMF); Italian Society of Reconstructive Plastic Surgery and Aesthetics (SICPRE); Italian Society of Gynecology and Obstetrics (SIGO); Italian Society of Neurosurgery (SINch); Italian Association of Hospital Pulmonologist (AIPO); Italian Society of Periodontology (SIdP); Italian Society of Ophthalmology (SOI); Italian Association of Hospital Otorhinolaryngologist (AOOI); Italian Association of Hospital Surgeons (ACOI); Association of Obstetricians Gynecologists Italian Hospital (AOGOI). A Multidisciplinary Approach on the Perioperative Antithrombotic Management of Patients With Coronary Stents Undergoing Surgery: Surgery After Stenting 2. *JACC Cardiovasc Interv*. 2018;11:417-34.
 29. Gargiulo G, Goette A, Tijssen J, Eckardt L, Lewalter T, Vranckx P, Valgimigli M. Safety and efficacy outcomes of double vs. triple antithrombotic therapy in patients with atrial fibrillation following percutaneous coronary intervention: a systematic review and meta-analysis of non-vitamin K antagonist oral anticoagulant-based randomized clinical trials. *Eur Heart J*. 2019;40:3757-67.
 30. Kerneis M, Gibson CM, Chi G, Mehran R, Alkhalaf F, Talib U, Pahlavani S, Mir M, Bode C, Halperin JL, Nafee T, Peterson ED, Verheugt FWA, Wildgoose P, van Eickels M, Lip GYH, Fox KAA, Cohen M. Effect of Procedure and Coronary Lesion Characteristics on Clinical Outcomes Among Atrial Fibrillation Patients Undergoing Percutaneous Coronary Intervention: Insights From the PIONEER AF-PCI Trial. *JACC Cardiovasc Interv*. 2018;11:626-34.
 31. Berry NC, Mauri L, Steg PG, Bhatt DL, Hohnloser SH, Nordaby M, Miede C, Kimura T, Lip GYH, Oldgren J, Ten Berg JM, Cannon CP. Effect of Lesion Complexity and Clinical Risk Factors on the Efficacy and Safety of Dabigatran Dual Therapy Versus Warfarin Triple Therapy in Atrial Fibrillation After Percutaneous Coronary Intervention: A Subgroup Analysis From the REDUAL PCI Trial. *Circ Cardiovasc Interv*. 2020;13:e008349.
 32. Jang WJ, Ahn SG, Song YB, Choi SH, Chun WJ, Oh JH, Cho SW, Kim BS, Yoon JH, Koo BK, Yu CW, Jang YS, Tahk SJ, Kim HS, Gwon HC, Lee SY, Hahn JY. Benefit of Prolonged Dual Antiplatelet Therapy After Implantation of Drug-Eluting Stent for Coronary Bifurcation Lesions: Results From the Coronary Bifurcation Stenting Registry II. *Circ Cardiovasc Interv*. 2018;11:e005849.
 33. Rhee TM, Park KW, Kim CH, Kang J, Han JK, Yang HM, Kang HJ, Koo BK, Kim HS. Dual Antiplatelet Therapy Duration Determines Outcome After 2- But Not 1-stent Strategy in Left Main Bifurcation Percutaneous Coronary Intervention. *JACC Cardiovasc Interv*. 2018;11:2453-63.
 34. Bechiri MY, Souteyrand G, Lefèvre T, Trouillet C, Rangé G, Cayla G, Dérimey F, Mangin L, Meneveau N, Caussin C, Motreff P, Amabile N. Characteristics of stent

thrombosis in bifurcation lesions analysed by optical coherence tomography. *EuroIntervention*. 2018;13:e2174-81.

35. Di Gioia G, Sonck J, Ferenc M, Chen SL, Colaïori I, Gallinoro E, Mizukami T, Kodeboina M, Nagumo S, Franco D, Bartunek J, Vanderheyden M, Wyffels E, De Bruyne B, Lassen JF, Bennett J, Vassilev D, Serruys PW, Stankovic G, Louvard Y, Barbato E, Collet C. Clinical Outcomes Following Coronary Bifurcation PCI Techniques: A Systematic Review and Network Meta-Analysis Comprising 5,711 Patients. *JACC Cardiovasc Interv*. 2020;13:1432-44.

36. Colombo A, Hall P, Nakamura S, Almagor Y, Maiello L, Martini G, Gaglione A, Goldberg SL, Tobis JM. Intracoronary stenting without anticoagulation accomplished with intravascular ultrasound guidance. *Circulation*. 1995;91:1676-88.

37. Hong SJ, Shin DH, Kim JS, Kim BK, Ko YG, Choi D, Her AY, Kim YH, Jang Y, Hong MK; IVUS-XPL Investigators. 6-Month Versus 12-Month Dual-Antiplatelet Therapy Following Long Everolimus-Eluting Stent Implantation: The IVUS-XPL Randomized Clinical Trial. *JACC Cardiovasc Interv*. 2016;9:1438-46.

38. Zhang J, Gao X, Kan J, Ge Z, Han L, Lu S, Tian N, Lin S, Lu Q, Wu X, Li Q, Liu Z, Chen Y, Qian X, Wang J, Chai D, Chen C, Li X, Gogas BD, Pan T, Shan S, Ye F, Chen SL. Intravascular Ultrasound Versus Angiography-Guided Drug-Eluting Stent Implantation: The ULTIMATE Trial. *J Am Coll Cardiol*. 2018;72:3126-37.

39. Lee SY, Kim JS, Yoon HJ, Hur SH, Lee SG, Kim JW, Hong YJ, Kim KS, Choi SY, Shin DH, Nam CM, Kim BK, Ko YG, Choi D, Jang Y, Hong MK. Early Strut Coverage in Patients Receiving Drug-Eluting Stents and its Implications for Dual Antiplatelet Therapy: A Randomized Trial. *JACC Cardiovasc Imaging*. 2018;11:1810-9.

40. Iliescu CA, Cilingiroglu M, Giza DE, Rosales O, Lebeau J, Guerrero-Mantilla I, Lopez-Mattei J, Song J, Silva G, Loyalka P, Paixao ARM, Yusuf SW, Perin E, Anderson VH, Marmagkiolis K. "Bringing on the light" in a complex clinical scenario: Optical coherence tomography-guided discontinuation of antiplatelet therapy in cancer patients with coronary artery disease (PROTECT-OCT registry). *Am Heart J*. 2017; 194:83-91.

41. Yeh RW, Secemsky EA, Kereiakes DJ, Normand SL, Gershlick AH, Cohen DJ, Spertus JA, Steg PG, Cutlip DE, Rinaldi MJ, Camenzind E, Wijns W, Apruzzese PK, Song Y, Massaro JM, Mauri L; DAPT Study Investigators. Development and Validation of a Prediction Rule for Benefit and Harm of Dual Antiplatelet Therapy Beyond 1 Year After Percutaneous Coronary Intervention. *JAMA*. 2016;315:1735-49.

42. Costa F, van Klaveren D, James S, Heg D, Räber L, Feres F, Pilgrim T, Hong MK, Kim HS, Colombo A, Steg PG, Zanchin T, Palmerini T, Wallentin L, Bhatt DL, Stone GW, Windecker S, Steyerberg EW, Valgimigli M; PRECISE-DAPT Study Investigators. Derivation and validation of the predicting bleeding complications in patients undergoing stent implantation and subsequent dual antiplatelet therapy (PRECISE-DAPT) score: a pooled analysis of individual-patient datasets from clinical trials. *Lancet*. 2017;389:1025-34.

43. Baber U, Mehran R, Giustino G, Cohen DJ, Henry TD, Sartori S, Ariti C, Litherland C, Dangas G, Gibson CM, Krucoff MW, Moliterno DJ, Kirtane AJ, Stone GW, Colombo A, Chieffo A, Kini AS, Witzensbichler B, Weisz G, Steg PG, Pocock S. Coronary Thrombosis and Major Bleeding After PCI With Drug-Eluting Stents: Risk Scores From PARIS. *J Am Coll Cardiol*. 2016;67:2224-34.

44. Mehran R, Rao SV, Bhatt DL, Gibson CM, Caixeta A, Eikelboom J, Kaul S, Wiviott SD, Menon V, Nikolsky E, Serebruany V, Valgimigli M, Vranckx P, Taggart D, Sabik JF, Cutlip DE, Krucoff MW, Ohman EM, Steg PG, White H. Standardized bleeding definitions for cardiovascular clinical trials: a consensus report from the Bleeding Academic Research Consortium. *Circulation*. 2011;123:2736-47.

Supplementary data

Supplementary Appendix 1. Further insights.

Supplementary Table 1. The DEFINITION⁷ criteria of complex bifurcation.

Supplementary Table 2. Risk scores validated to inform dual antiplatelet therapy duration selection.

Supplementary Table 3. Major and minor criteria for high bleeding risk (HBR) at the time of PCI (adapted from Urban et al²¹).

The supplementary data are published online at:

<https://eurointervention.pcronline.com/>

doi/10.4244/EIJ-D-20-00648

