REVIEW ARTICLE

# Patients with atrial fibrillation undergoing percutaneous coronary intervention

## Current concepts and concerns: part II

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**KEY WORDS**

antithrombotic prophylaxis, atrial fibrillation, coronary artery disease, percutaneous coronary intervention

**ABSTRACT**

Atrial fibrillation (AF) and coronary artery disease (CAD) often present concomitantly. Given the increased risk of thrombotic complications with either of them but different pathogenesis of clot formation, combined antithrombotic therapy is necessary in patients developing acute coronary syndrome and/or undergoing percutaneous coronary intervention (PCI). Different antithrombotic regimens in this group of patients have been summarized and discussed earlier. Triple therapy remains the treatment of choice in these patients despite the increased risk of hemorrhagic complications. Given the absence of evidence from randomized controlled trials, balancing the risk of stroke and stent thrombosis against the risk of major bleeding is a challenge. Precise stroke and bleeding risk assessment is an essential part of the decision making process regarding antithrombotic management.

Continuing the discussion of current concepts and concerns of antithrombotic management in AF patients undergoing PCI, we emphasize the importance of various strategies to reduce bleeding in the modern era, namely, radial access combined with careful selection of a $P2Y_{12}$ receptor inhibitor, use of newer drug-eluting stents, and uninterrupted anticoagulation for patients undergoing procedures. We also focus on the role of the non-vitamin K oral anticoagulants (novel oral anticoagulants, eg, dabigatran, rivaroxaban, apixaban, and edoxaban) which are increasingly used for stroke prevention in AF. Finally, recent recommendations on the management of antithrombotic therapy in AF patients presenting with acute coronary syndrome and/or undergoing PCI as well as ongoing clinical trials and future directions are highlighted.

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**Introduction** Atrial fibrillation (AF) and coronary artery disease (CAD) often present concomitantly.[1,2] Given the increased risk of thrombotic complications with either of them but different pathogenesis of clot formation,[3] combined antithrombotic therapy is necessary in patients developing acute coronary syndrome (ACS) and/or undergoing percutaneous coronary intervention (PCI).[4,5] A variety of antithrombotic regimens in this group of patients have been summarized and discussed earlier. Despite the high risk, combination triple therapy remains the treatment of choice in this group of patients.[6-12] Given the absence of clinical trials, balancing the risk of stroke and stent thrombosis with that of major bleeding represents a challenging area. Precise stroke and bleeding risk assessment is an essential part of decision making process regarding antithrombotic management.[13-14]

Continuing our discussion of antithrombotic management in AF patients undergoing PCI, we emphasize the importance of various strategies to reduce bleeding in the modern era, namely radial access combined with careful selection of a $P2Y_{12}$ receptor inhibitor, use of newer drug-eluting stents (DESs), and uninterrupted anticoagulation for patients undergoing procedures. We also focus on the role of the non-vitamin K antagonist, OACs (also known as new or novel oral anticoagulants [NOACs], eg, dabigatran, rivaroxaban, apixaban, and edoxaban), which are increasingly used for stroke prevention in AF. Finally,

recent recommendations on the management of antithrombotic therapy in AF patients presenting with ACS and/or undergoing PCI as well as ongoing clinical trials and future directions are highlighted.

**Novel oral anticoagulants in patient with atrial fibrillation undergoing percutaneous coronary intervention** The use of NOACs[15] is one of the major concerns in patients with AF undergoing PCI because of their increasing utilization in AF patients for stroke prevention,[16-18] while much less evidence has become available to guide their use in a clinical scenario of AF patients who present with ACS or undergo elective PCI. Current guidelines consist mainly of expert opinions based on observational data.[4]

NOACs in common use include the direct thrombin inhibitor, dabigatran, and factor Xa inhibitors, rivaroxaban, apixaban, and edoxaban. They have been shown to be either noninferior to warfarin (dabigatran, 110 mg bid; rivaroxaban, 20 mg qd; and edoxaban, 30 mg qd or 60 mg qd) or superior to warfarin (dabigatran, 150 mg bid; apixaban, 5 mg bid) with respect to primary efficacy endpoint (stroke or systemic embolism). In terms of safety (major and clinically relevant nonmajor bleeding for rivaroxaban; major bleeding for all the other), both doses of edoxaban, low-dose dabigatran, and apixaban were significantly better than warfarin, while rivaroxaban and a high dose of dabigatran were noninferior. All the NOACs were associated with a lower risk of intracranial hemorrhage than warfarin. Since they do not require regular laboratory monitoring and have fewer food and drug interactions and a stable anticoagulant effect with fixed dose, they were favored for stroke prevention in AF.[16-18]

However, there are few data to support the use of the NOACs as part of triple antithrombotic therapy or in conjunction with single antiplatelet therapy instead of warfarin in patients after PCI, since patients with ACS, MI, or receiving dual antiplatelet therapy were excluded from the AF trials, and patients with AF and indications for anticoagulation were excluded from the ACS trials.

Subgroup analyses from the pivotal AF trials with NOACs revealed no impact of combined treatment with antiplatelets on their safety and efficacy profile compared with warfarin. There was a broadly similar increase in major bleeding rates when warfarin or NOACs were combined with antiplatelet drugs.[19-22]

What do the ACS trials with NOACs tell us? The phase II RE-DEEM trial of dabigatran in addition to dual antiplatelet therapy in patients with an index MI evaluated different doses of dabigatran and showed a dose-related increase in the rate of major bleeding or clinically relevant nonmajor bleeding, with no difference in ischemic event rates.[23]

In the phase II APPRAISE trial, there was a trend towards a lower rate of myocardial infarction (MI), severe recurrent ischemia, ischemic stroke, or cardiovascular death with apixaban, 2.5 mg bid and 10 mg qd (2 higher doses, 10 mg bid and 20 mg qd were associated with the highest rates of clinically relevant bleeding and were prematurely terminated), especially in combination with aspirin monotherapy and in nonrevascularized patients.[24] Apixaban 5 mg bid was selected for the phase III APPRAISE-2 trial in addition to standard antiplatelet therapy, but no reduction in recurrent ischemic events and a significant increase in bleeding events, including fatal bleedings and intracranial hemorrhage, was observed compared with placebo irrespectively of the antiplatelet regime (aspirin alone or dual antiplatelet therapy).[25] Of note, dabigatran and apixaban were tested in ACS patients in addition to antiplatelets with similar doses to those in AF trials, while a reduced dose was used in ACS trials with rivaroxaban.

Two doses of rivaroxaban were studied in the phase III ATLAS ACS 2–TIMI 51 trial (2.5 mg bid and 5 mg bid) selected from the phase II ATLAS ACS–TIMI 46 trial owing to their favorable efficacy and safety profile.[26,27] Rivaroxaban was found to reduce a significantly combined endpoint of death from cardiovascular causes, MI, or stroke, when added to standard dual antiplatelet therapy compared with placebo, irrespectively of the dose: hazard ratio (HR), 0.84; 95% confidence interval (CI), 0.72–0.97 for 2.5 mg bid regime, and HR, 0.85; 95% CI, 0.73–0.98 for 5 mg bid regime.[26] Rivaroxaban 2.5 mg bid was also associated with the reduction of cardiovascular and all-cause mortality (HR, 0.66; 95% CI, 0.51–0.86, and HR, 0.68; 95% CI, 0.53–0.87, respectively). Nonetheless, better efficacy of triple therapy was achieved at a cost of a significantly higher rate of major bleeding and intracranial hemorrhage: 2.1% vs 0.6% and 0.6% vs 0.2%, respectively.[26]

Thus, in patients with a recent ACS, addition of one of the NOACs to antiplatelet therapy results in a modest reduction in cardiovascular events but a substantial increase in bleeding, most pronounced when NOACs are combined with dual antiplatelet therapy.[28]

There were concerns of use of the NOACs in patients with CAD because of increased rates of MI in the dabigatran arm in the RE-LY trial during follow-up compared with warfarin that appeared to be insignificant after reanalysis with newly identified events.[29-31] Meta-analyses, including trials of dabigatran in patients with ACS, pulmonary embolism, and deep vein thrombosis found the risk of MI to be significantly increased.[32,33] For example, in the analysis of Douxfils et al.,[33] odds ratio (OR) for MI was 1.41 (95% CI, 1.11–1.80); however, this did not translate into increased mortality (OR, 0.90; 95% CI, 0.81–1.01) as well as bleeding risk was lower with dabigatran than with warfarin (OR, 0.85; 95% CI, 0.76–0.96).

In the real-world setting, an increased risk of MI with dabigatran was observed only in patients switching from warfarin to dabigatran and only within the first 2 months after switching (for 110

mg bid dose: HR, 3.01; 95% CI, 1.48–6.10; for 150 mg bid dose: HR, 2.97; 95% CI, 1.31–6.73); this was not seen among anticoagulation-naïve patients in whom dabigatran was initiated as well as in those started dabigatran after being on warfarin for longer than 2 months.[34]

There was no overall increase in the rate of MI observed in phase 3 trials with rivaroxaban and apixaban; however, numerically more MIs were registered with low-dose edoxaban compared with warfarin in the ENGAGE-AF trial.[19,20,35] When data on all the NOACs were pooled into a meta-analysis, no difference in the rate of MI was observed between the NOACs and warfarin. However, when only low-dose regimes were analyzed, significantly more MIs were reported.[36]

One explanation for the higher rate of MI with dabigatran is that warfarin inhibits several coagulation factors (II, VII, IX, X) and factor Xa inhibitors offer upstream inhibition of the coagulation cascade, whereas dabigatran targets thrombin only, that is, the final stage in the coagulation cascade. With the rupture of an atherosclerotic plaque, a patient receiving warfarin would have a lower baseline prothrombin for transformation into thrombin. Inhibition of 1 molecule of factor Xa eventually prevents conversion of up to 1000 molecules of prothrombin to thrombin. In contrast, patients anticoagulated with dabigatran have a similar baseline thrombin level to nonanticoagulated patients; therefore, prothrombin activation in the acute setting cannot be prevented effectively with the therapeutic dose of dabigatran that is sufficient for chronic anticoagulation.[3,7,37]

In summary, the current evidence supports the use of NOACs in AF with stable CAD. In terms of ACS, rivaroxaban 2.5 mg bid appears to bring additional benefits and will be approved for use as part of secondary prevention with aspirin alone or aspirin plus clopidogrel in patients without a history of stroke or transient ischemic attack by the United Kingdom National Institute for Health and Care Excellence (NICE).[38] Ongoing trials with dabigatran and rivaroxaban will shed new light on their safety and efficacy when used in combination with antiplatelets. Currently, there are no reasons to change a well-established anticoagulation regime in a patient with preexisting AF who have developed ACS or have undergone elective PCI, and no evidence supports the selection of one of the NOACs in favor of warfarin or vice versa in patients with new-onset AF.[4]

## Strategies to reduce bleeding complications associated with triple therapy

**Site of vascular access for percutaneous coronary intervention** A radial approach is associated with over 50% relative reduction in bleeding and access site complications compared with the femoral approach in various clinical scenarios and should generally be preferred.[4,39] For example, in the recent STEMI-RADIAL trial (ST-Elevation Myocardial Infarction treated by RADIAL or femoral approach), there was a lower rate of major bleeding and vascular access site complications in the radial group in comparison with the femoral group (1.4% and 7.2%, respectively, $P = 0.0001$). Radial access was also associated with fewer net adverse clinical events defined as a composite of death, MI, stroke, and major bleeding/vascular complications (4.6% vs 11.0%, $P = 0.0028$), shorter intensive care stay (2.5 vs 3.0 days, $P = 0.0038$), and lower contrast utilization (170 ml vs 182 ml, $P = 0.01$). Mortality was not affected by the choice of an access site.[40]

Patients receiving combination antithrombotic therapy have a higher bleeding risk; therefore, radial access should be preferred.[41,42] In the STENTICO registry (STENTIng and oral antiCOagulants) involving anticoagulated patients, the majority of whom were AF patients, bleeding risk was 10.3% with a femoral approach and 3.8% with a radial one.[42]

Approximately 3% of radial artery access leads to radial artery occlusion even in patients with uninterrupted OAC although intraprocedural administration of parenteral anticoagulants (eg, heparin) significantly reduces this risk.[43] Thus, radial artery access is feasible and safe for PCI against the background of OAC and dual (or single) antiplatelet therapy.

**Choice of $P2Y_{12}$ receptor inhibitor** Aspirin is an established component of dual antiplatelet therapy in ACS. However, in terms of $P2Y_{12}$ receptor inhibitors, the choice is more complex.[44] The current standard treatments in ACS include clopidogrel, prasugrel, or ticagrelor.[10,11] Prasugrel and ticagrelor (the third-generation $P2Y_{12}$ receptor inhibitors) are both more potent than clopidogrel, which is associated with inadequate response in approximately one-third of the patients and eventually recurrent ischemic events.[45,46] In the pivotal trials (TRITON-TIMI 38 and PLATO), treatment with prasugrel and ticagrelor resulted in a reduction of the primary and secondary efficacy endpoints compared with clopidogrel, but with an increase in major bleedings.[47,48] Ticagrelor and prasugrel are now recommended in ACS patients, leaving clopidogrel only for cases when they are not available.[49,50]

In case of combination therapy, the use of more potent antiplatelets may lead to a further increase of bleeding risk. In a study by Sarafoff et al.,[51] which compared prasugrel with clopidogrel as part of triple therapy in AF patients, TIMI major and minor bleeding at 6 months were more frequent with prasugrel (28.6% vs 6.7%; HR, 3.2; 95% CI, 1.1–9.1). No significant improvement was achieved with respect to ischemic endpoint (composite of death, myocardial infarction, ischemic stroke, or definite stent thrombosis).[51] Also, prasugrel and ticagrelor have not been approved for the elective patients and cannot be used with this indication (irrespective of AF history).

Thus, third generation $P2Y_{12}$ receptor inhibitors should not be part of triple antithrombotic therapy in patients with AF unless a patient is known to be resistant to clopidogrel and/or

aspirin or has developed stent thrombosis while being on appropriate antithrombotic therapy.[4]

**Drug-eluting versus bare metal stents** The type of stent used to be of paramount importance for the duration of triple therapy. Bare metal stents (BMSs) were favored because of the lower minimal duration of dual antipletelet therapy required to prevent BMS thrombosis.[8] DESs were recommended only in certain situations where significant benefit over BMSs was expected, such as long lesions, small vessels, diabetes, and others.

This is because, historically, DESs were associated with a higher incidence of bleeding complications, shown in a retrospective AF cohort of Ruiz-Nodar et al.[52] Also, the use of DESs did not necessarily warrant better prognosis with respect to ischemic outcomes (eg, cardiovascular death, acute MI, target lesion revascularization) as well as all-cause mortality.[53] Newer generations of DESs mean that the differences between DESs and BMSs in terms of stent thrombosis risk are largely nonexistent.[54,55] Everolimus- or zotarolimus-eluting stents allow dual antiplatelet therapy to be limited to 1 month, and other new DESs (biolimus A9- and amphilimus-eluting stents) require dual antiplatelet therapy up to 6 months, which is half as long as the first-generation DESs.[9] Also, risk for events due to disruption of dual antiplatelet therapy was found not to depend on stent type.[56,57]

A recent analysis on the impact of the type of stent on outcomes in the AFCAS registry, (in which AF patients with a range of stents widely available in clinical practice, including the first and second generation, were included) showed that 1 year follow-up rates and risks of major adverse cardiac and cerebrovascular events (MACCEs) and total bleeding events were comparable between the BMS and DES groups, but stent thrombosis was significantly more frequent in patients with BMSs (1.9% vs 0%).[58]

Taken together, with the lower occurrence of stent thrombosis in patients with newer-generation DESs compared with BMSs, they should be used unless the patient has a very high bleeding risk or unavoidable surgery is planned within 6 months after PCI.[4]

**Intensity of anticoagulation and quality of anticoagulation control** If VKA (eg, warfarin) is used as part of combination therapy with antiplatelet drugs (either single or dual), lower intensity of anticoagulation and more narrow therapeutic window are recommended (international normalized range [INR] of 2.0 to 2.5).[4] If NOACs are used instead, the lower doses tested in stroke prevention trials have to be considered, ie, dabigatran, 110 mg bid; rivaroxaban, 15 mg qd; and apixaban, 2.5 mg bid.[4] For VKAs, a good quality of anticoagulation control, defined as time in therapeutic range over 70%, is of paramount importance, since OACs but with poorer control may cause more adverse events than when no OAC is applied at all.[59,60]

**Proton-pump inhibitors** Increased radial access has reduced access site hemorrhage to the extent that the gastrointestinal tract is now the commonest location of bleeding in patients undergoing PCI. In a study by Ho et al.,[61] adding an OAC to dual antiplatelet therapy led to a 5-fold increase in the risk of gastrointestinal bleeding.

Thus, proton-pump inhibitors should be considered in all patients receiving antiplatelets, as they are capable of reducing risk of gastrointestinal bleeding and do not increase the risk of cardiovascular events.[4] Omeprazole and esomeprazole may interfere with clopidogrel activity by competitive inhibition of CYP2C19, thus reducing its ability to convert clopidogrel to active metabolite.[62,63]

**Periprocedural anticoagulation** An uninterrupted anticoagulation strategy (in conjunction with radial access, femoral access is safe if INR is below 2.0) is the preferred strategy as it does not increase perioperative complications during coronary stenting and is a simple alternative to conventional heparin bridging.[4,5,64,65]

Performing PCI without interrupting OAC helps avoid episodes of subtherapeutic anticoagulation that carries increased prothrombotic risk if not fully protected with heparin bridging as well as episodes of fluctuation of anticoagulation effect after reinitiation of OAC. In patients treated with the NOACs bridging therapy is also not necessary. Given their rapid onset and offset, they can be stopped 24 to 72 hours in advance depending on the NOAC used and the patient's kidney function.

Glycoprotein receptor inhibitors should generally not be given because of increased risk of severe bleeding complications on a background of therapeutic anticoagulation with the VKA and probably with the NOACs as well. In the latter, provisional use of glycoprotein receptor inhibitors was suggested in high-risk lesions, large thrombus burden, no-reflow/slow flow, threatened vessel closure in elective setting and non-ST-segment elevation MI but not in ST-segment elevation MI.[66]

Also, in a recent meta-regression analysis, the direct thrombin inhibitor, bivalirudin, was shown to reduce major and minor bleeding regardless of the estimated baseline hemorrhagic risk and to have no negative impact on mortality and MI rate compared with unfractionated heparin in patients treated with PCI.[67]

**Comorbidities** As stated earlier, a high bleeding risk should not be used to rule out OAC but to correct modifiable risk factors. Other independent predictors of bleeding in specific AF populations receiving combination therapy include mild kidney disease (glomerular filtration rate of 60 to 89 ml/min/1.73 $m^2$) (HR, 2.43; 95% CI, 1.11–5.34) and anemia.[68]

Anemia (hemoglobin <12 g/dl in women and <13 g/dl in men) is common among AF patients undergoing PCI (30%) and has a significant

**TABLE** Antithrombotic therapy in patients with atrial fibrillation undergoing percutaneous coronary intervention (adapted from Lip et al., 2014[4])

| Clinical setting | Stroke risk ($CHA_2DS_2$-VASc score | Bleeding risk (HAS-BLED score) | Timing after PCI | | | |
|---|---|---|---|---|---|---|
| | | | 4th week | 6th month | 12th month | lifelong |
| elective PCI in stable CAD | moderate<br>1 in men<br>2 in women[a] | low/moderate<br>0–2 | triple therapy (OAC + dual antiplatelet therapy)[b], or<br>*OAC + clopidogrel*, or<br>*dual antiplatelet therapy* | OAC + single antiplatelet therapy, or<br>*dual antiplatelet therapy* | | OAC, or<br>*OAC + single antiplatelet therapy*[c] |
| | | high<br>≥3 | OAC + clopidogrel, or<br>*dual antiplatelet therapy* | | | |
| | high<br>≥2 in men<br>≥3 in women[b] | low/moderate<br>0–2 | triple therapy (OAC + dual antiplatelet therapy)[b], or<br>*OAC + clopidogrel* | OAC + single antiplatelet therapy | | |
| | | high<br>≥3 | triple therapy (OAC + dual antiplatelet therapy), or<br>*OAC + clopidogrel*, or<br>*dual antiplatelet therapy* | | | |
| ACS (either STEMI or NSTEMI) | moderate<br>1 in men<br>2 in women[a] | low/moderate<br>0–2 | triple therapy (OAC + dual antiplatelet therapy) | | OAC + single antiplatelet therapy | |
| | | high<br>≥3 | triple therapy (OAC + dual antiplatelet therapy), or<br>*OAC + clopidogrel* | OAC + single antiplatelet therapy | | |
| | high ≥2 in men<br>≥3 in women[d] | low/moderate<br>0–2 | triple therapy (OAC + dual antiplatelet therapy) | | OAC + single antiplatelet therapy | |
| | | high<br>≥3 | triple therapy (OAC + dual antiplatelet therapy), or<br>*OAC + clopidogrel* | OAC + single antiplatelet therapy | | |

a 1 stroke risk factor in addition to female sex
b no longer than 6 months
c in very selected cases (eg, stenting of the left main coronary artery, proximal bifurcation, recurrent myocardial infarction)
d 2 or more stroke risk factors in addition to female sex

Italicized text indicates alternative options that may be considered.

Single antiplatelet therapy includes clopidogrel 75 mg qd or, alternatively, aspirin 75-100 mg qd. Dual antiplatelet therapy consists of clopidogrel 75 mg qd and aspirin 75 mg qd (75-100 mg qd when used in combination with OAC).

Abbreviations: ACS, acute coronary syndrome; CAD, coronary artery disease; INR, international normalized ratio; NSTEMI, non-ST-segment elevation myocardial infarction; OAC, oral anticoagulation, either warfarin (INR, 2.0–2.5) or non-VKA oral anticoagulant at the lower tested dose in atrial fibrillation (dabigatran 110 mg bid, rivaroxaban 15 mg qd or apixaban 2.5 mg bid); PCI, percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction, VKA, vitamin K antagonist

negative prognostic impact with respect to MACCE (29.1% vs 19.4% in patients without anemia), and minor bleeding events (7.0% vs 3.3%), with a trend towards more total bleeding events (25.2% vs 21.7%). This was probably attributed in part to chronic kidney disease, as it was more prevalent among anemic patients. Anemia was also an independent predictor of all-cause mortality (HR, 1.62; 95% CI, 1.05–2.51).[69]

On the contrary, mild thrombocytopenia (<150 × $10^9$/l) that occurred in approximately 10% of AF patients treated with PCI did not affect either MACCE or major bleeding rate even with the triple therapy being prescribed in the majority of patients.[70]

**Current recommendations and future directions** Current recommendations on the choice and duration of antithrombotic therapy in AF patients undergoing PCI according to a recently updated joint consensus document of the European Society of Cardiology Working Group on Thrombosis, European Heart Rhythm Association (EHRA), European Association of Percutaneous Cardiovascular Interventions (EAPCI) and European Association of Acute Cardiac Care (ACCA) endorsed by the Heart Rhythm Society (HRS) and Asia-Pacific Heart Rhythm Society (APHRS) are summarized in the TABLE.

Current practice is determined by 3 major steps in the decision-making process: bleeding risk, stroke risk, and clinical setting. Nonetheless, many questions still remain unanswered, particularly regarding the safety and efficacy of the NOACs and the third-generation $P2Y_{12}$ receptor inhibitors, as well as the potential variety of drug combinations, optimal duration, clinical setting, and risk stratum.

Two trials involving NOACs in AF patients treated with PCI are currently underway. The

first one is the PIONEER AF-PCI trial evaluating rivaroxaban, 2.5 mg bid, plus low-dose aspirin, 75–100 mg qd, and clopidogrel, 75 mg qd (or prasugrel, 10 mg qd, or ticagrelor, 90 mg bid) followed by rivaroxaban, 15 mg qd (or 10 mg qd for individuals with moderate renal impairment) plus low-dose aspirin for 12 months in comparison with the same regime but with dose-adjusted VKA instead of rivaroxaban. The second one is REDUAL-PCI comparing dual antithrombotic therapy regimen of dabigatran, 110 mg bid or 150 mg bid, plus clopidogrel or ticagrelor with a triple antithrombotic therapy of warfarin plus clopidogrel or ticagrelor plus low-dose aspirin.[71,72]

In the ISAR TRIPLE trial, a 6-week clopidogrel therapy after DES implantation and receiving concomitant aspirin and VKAs is compared with 6-month therapy to assess whether a shorter duration of triple therapy is associated with improved clinical outcomes.[73]

The MUSICA-2 trial addresses the safety and efficacy of dual antiplatelet therapy of aspirin, 300 mg, plus clopidogrel, 75 mg, compared with the triple regime (acenocoumarol plus aspirin, 100 mg, plus clopidogrel, 75 mg) in patients with AF and a $CHADS_2$ score of 2 or lower treated with PCI and stenting.[74] The LASER registry is collecting real-world data on how the problems with stents on the background of full anticoagulation are approached in order to evaluate the frequently used treatment modalities and document the associated adverse cardiac and major bleeding event rates with each treatment strategy.[75]

**Conclusions** There is an increasing number of treatment modalities for patients with AF undergoing PCI including new types of stents and antithrombotic drugs. However, evidence supporting their use is limited. No large randomized controlled trials providing head-to-head comparison of various modalities of antithrombotic therapy are available thus far. Triple antithrombotic therapy remains necessary for the prevention of thrombotic complications related to AF and ACS and/or PCI. Application of a variety of strategies may help reduce the risk of hemorrhage associated with the triple therapy. Also, a shorter duration or combination of an OAC with only single antiplatelet agent have been approved now and can be used in patients with moderate stroke or high bleeding risk or both. Large randomized trials are needed to further characterize the efficacy and safety of the various combinations of OAC (including NOACs) and antiplatelets (including newer $P2Y_{12}$-receptor inhibitors) in AF patients undergoing PCI.

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ARTYKUŁ POGLĄDOWY

# Przezskórne interwencje wieńcowe u chorych z migotaniem przedsionków

## Aktualne koncepcje i obawy – część 2

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**STRESZCZENIE**

Migotanie przedsionków (*atrial fibrillation* – AF) i choroba wieńcowa (*coronary artery disease* – CAD) często występują równocześnie. Ponieważ każde z nich zwiększa ryzyko powikłań zakrzepowych, ale w innym patomechanizmie powstawania zakrzepu, konieczne jest skojarzone leczenie przeciwzakrzepowe u chorych z ostrymi zespołami wieńcowymi (OZW) i/lub poddawanych przezskórnej interwencji wieńcowej (*percutaneous coronary intervention* – PCI). Poprzednio omówiono i podsumowano różne schematy leczenia przeciwzakrzepowego w tej grupie chorych. Terapia potrójna pozostaje w tej grupie leczeniem z wyboru, mimo zwiększonego ryzyka powikłań krwotocznych. Ze względu na brak danych z badań z randomizacją, porównanie ryzyka udaru i zakrzepicy w stencie z ryzykiem poważnego krwawienia jest trudne. Kluczowym elementem podejmowania decyzji o leczeniu przeciwzakrzepowym jest precyzyjna ocena ryzyka udaru i krwawienia.

Kontynuując omawianie obecnych koncepcji i obaw dotyczących leczenia przeciwzakrzepowego u chorych z AF poddawanych PCI, podkreślono wagę różnych współczesnych strategii zmniejszania ryzyka krwawienia, w tym dostępu promieniowego połączonego ze starannym doborem inhibitora receptora $P2Y_{12}$, stosowania nowszych stentów uwalniających leki oraz nieprzerywania antykoagulacji na czas zabiegów. Skupiono się też na roli doustnych antykoagulantów niebędących antagonistami witaminy K (dabigatran, rywaroksaban, apiksaban i edoksaban), które coraz częściej stosuje się w celu prewencji udaru w AF. Na koniec podano najnowsze zalecenia dotyczące leczenia przeciwzakrzepowego u chorych z AF i OZW i/lub poddawanych PCI, a także podsumowano trwające badania kliniczne i przyszłe kierunki rozwoju.

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