

# Osvrt na intervencijsku kardiologiju u 2021. godini

## An Overview of Interventional Cardiology in 2021

**Eduard Margetić\***

Medicinski fakultet  
Sveučilišta u Zagrebu, Klinički  
bolnički centar Zagreb,  
Zagreb, Hrvatska

University of Zagreb School of  
Medicine, University Hospital  
Centre Zagreb, Zagreb,  
Croatia

**CITATION:** *Cardiol Croat.* 2022;17(3-4):73-5. | <https://doi.org/10.15836/ccar2022.73>

**\*ADDRESS FOR CORRESPONDENCE:** Eduard Margetić, Klinički bolnički centar Zagreb, Kišpatičeva 12, HR-10000 Zagreb, Croatia. / Phone: +385-1-2388-888 / E-mail: [eduard.margetic@gmail.com](mailto:eduard.margetic@gmail.com)

**ORCID:** Eduard Margetić, <https://orcid.org/0000-0001-9224-363X>

U proteklih godinu dana ostvaren je znatan napredak u perkutanom koronarnim intervencijama (PCI), intervencijama u strukturnim bolestima srca te u popratnoj farmakoterapiji. Taj je napredak postignut unatoč kontinuiranom opterećenju zdravstvenih djelatnika i zdravstvenih sustava pandemijom bolesti COVID-19.

Još uvijek prisutan je niz prijepornih i neusuglašenih stavova u nekim područjima intervencijske kardiologije koje su u preglednome članku u ovome broju časopisa *Cardiologia Croatica* dotaknuli Escaned *i sur.*<sup>1</sup> te nam dali pregled recentnih istraživanja i poželjnih promjena u kliničkoj praksi sa svrhom optimiranja ishoda perkutanom intervencijama.

Jedno od otvorenih i neriješenih pitanja jest potpuna revaskularizacije miokarda u bolesnika s akutnim koronarnim sindromom (ACS) i višezilnom koronarnom bolešću srca. Dosadašnja praksa, a i postojeće smjernice, upućivali su na potrebu revaskularizacije samo „culprit“ lezija u akutnom infarktu miokarda s elevacijom ST-segmenta (STEMI), uz iznimku bolesnika u kardiogenom šoku. Na temelju recentnih istraživanja, revaskularizacija „nonculprit“ lezija postaje realna opcija. Važno je napomenuti da nema dokaza o koristi od procjene funkcijske važnosti lezije. Stoga je angiografski vođena PCI znatno suženih „nonculprit“ lezija (>70 %) u žilama promjera >2 mm indicirana u svih bolesnika sa STEMI-jem, neovisno o vrijednostima FFR-a (engl. *Fractional Flow Reserve*).

Revaskularizacija u višezilnoj koronarnoj bolesti srca i dalje ostaje važna i kontroverzna tema. S jedne strane, ishodi istraživanja *SYNTAX II*<sup>2</sup> nisu pokazali inferiornost „SYNTAX II strategije“ u usporedbi s kirurškom revaskularizacijom miokarda tijekom petogodišnjega praćenja. S druge strane, rezultati istraživanja *FAME III*<sup>3</sup> nisu dokazali neinferiornost FFR-om vođene PCI u usporedbi s kardiokirurškim liječenjem.

In the past year, significant progress has been achieved in percutaneous coronary interventions (PCI), in interventions for structural heart diseases, and in supportive pharmacotherapy. These advancements have taken place despite the continuous burden on healthcare workers and systems caused by the COVID-19 pandemic.

There are still a number of controversial and unresolved issues in some fields of interventional cardiology, which have been discussed by Escaned et al. in a review article<sup>1</sup> in this issue of *Cardiologia Croatica*, who provide an overview of recent studies and beneficial changes in clinical practice, with the goal of optimizing the outcomes of percutaneous interventions.

One of the open and unsolved questions is application of complete myocardial revascularization in patients with acute coronary syndrome (ACS) and multivessel coronary heart disease. Current clinical practice and guidelines indicated only revascularization of „culprit“ lesions was necessary in ST-segment elevation myocardial infarction (STEMI), excepting patients in cardiogenic shock. Based on recent research, the revascularization of „non-culprit“ lesions has become a realistic option. It is important to note that there is no evidence on the benefits of assessing the functional significance of lesions. Angiographically guided PCI of tight „non-culprit“ lesions (>70%) in blood vessels with a >2 mm diameter is thus indicated in all patients with STEMI, regardless of fractional flow reserve (FFR) values.

Revascularization remains an important and controversial topic in multivessel coronary heart disease. On the one hand, the results of the *SYNTAX II* study<sup>2</sup> have shown the non-inferiority of the „SYNTAX II strategy“ during 5-year follow-up of surgical myocardial revascularization. On the other hand, the results of the *FAME III* study<sup>3</sup> did not demonstrate non-inferiority of FFR-guided PCI in comparison with cardiosurgical treat-

**RECEIVED:**  
April 5, 2022

**ACCEPTED:**  
April 14, 2022



Stoga nam nedvojbeno predstoje dodatna istraživanja koja bi dala odgovore na ova još uvijek neriješena pitanja.

Utjecaj tehnološkog napretka na polju stentova obloženih lijekom omogućuje nam da uporabom stentova s ultratankim „strutovima“ dodatno smanjimo postintervencijski rizik od nastanka neželjenih kardiovaskularnih događaja.

Liječenje koronarnih arterija maloga promjera ostaje velik izazov te se u ovakvim situacijama sve više preferira izbjegavanje stentova. Recentna istraživanja to podržavaju, jer je dokazana kontinuirana učinkovitost i sigurnost lijekom obloženih balona u usporedbi s lijekom obloženim stentovima kod novonastalih lezija u koronarnim arterijama maloga promjera.

Što se tiče kompleksnih koronarnih lezija, kod intervencija na deblu lijeve koronarne arterije sa zahvaćanjem njezina račvišta, većina istraživanja i dalje podupire strategiju ugradnje jednog stenta gdje god je to moguće i izvedivo.

Na području PCI-ja kroničnih potpunih okluzija (CTO) nužno je selektivno pristupiti svakom bolesniku, dodatno razjasniti komu, kada i zašto, te standardizirati postupke i tehnike izvođenja.

Zamijećeni su trendovi oživljavanja aterektomije (osobito u SAD-u), te intravaskularne litotripsije u bolesnika s teškim kalcificiranim novonastalim lezijama u sklopu liječenja primjenom PCI-ja.

Na polju intravaskularnog oslikavanja recentna istraživanja pokazuju neprekidno smanjenje učestalosti neželjenih velikih kardiovaskularnih događaja ako se PCI vodi intravaskularnim ultrazvukom u usporedbi s intervencijama vođenima isključivo angiografijom.

Posebnu su pozornost izazvali rezultati prve kliničke studije koja je istraživala korist od primjene funkcionalne koronarne angiografije (bežična, CT angiografijom izvedena rezerva protoka) za vođene perkutane koronarne intervencije, te je uspjela dokazati smanjenje učestalosti velikih neželjenih kardiovaskularnih događaja ako se PCI vodi s pomoću takve tehnologije.

Sve se više pažnje poklanja sastavu aterosklerotskoga plaka i poglavito prisutnosti tankoga fibroznog pokrova <65 µm (TCFA) u odnosu prema funkcijski procijenjenoj značajnosti stenozе. Tako je istraživanje *COMBINE OCT-FFR*<sup>4</sup> pokazalo da kombinacija negativnog FFR-a i TCFA-a prisutnoga plaka ima mnogo veću učestalost neželjenih kardiovaskularnih događaja u usporedbi s negativnim FFR i TCFA odsutnim plakom.

Na području transkateterske terapije stenozе aortalnog zalistka uspoređivane su najnovije generacije različitih tipova transkateterskih bioloških zalistaka („self-expandable vs. balloon-expandable“), te među njima nisu nađene razlike u učestalosti skupnih neželjenih kardiovaskularnih događaja.

Nasuprot tomu, „tihu“ ishemijske ozljede mozga otkrivene su magnetnom rezonancijom u >80 % bolesnika liječenih postupkom TAVI (engl. *transcatheter aortic valve implantation*). Radi prevencije klinički značajnih i „tihih“ moždanih lezija ispitivani su sustavi protekcije mozga tijekom TAVI-ja koji nisu pokazali nedvojbenu korist od njihove rutinske primjene te se u najboljem slučaju trebaju rabiti selektivno.

Ispitivanja dugoročnih komparativnih svojstava TAVI-ja i SAVR-a (engl. *surgical aortic valve replacement*) u populaciji bolesnika niskog rizika sa stenozom aortalne valvule poka-

ment. There is thus no doubt that further research is required to provide answers to these still-unresolved questions.

Technological progress in the field of drug-eluting stents has enabled us to use stents with ultra-thin struts to further reduce post-interventional risk of unwanted cardiovascular events.

Treatment of small diameter coronary arteries remains a significant challenge, and avoiding stents in such situations has become increasingly common. This treatment preference has been supported by recent studies, since the continuous effectiveness and safety of drug-coated balloons has been demonstrated in comparison with drug-eluting stents for newly-formed lesions in small diameter coronary arteries.

As for complex coronary lesions, most studies still support the strategy of placing 1 stent whenever possible in interventions on the left main coronary artery involving its bifurcations.

For chronic total occlusions (CTO), every patient requires a selective approach, with additional clarification on who, when, and why as well as standardization of procedures and performance techniques.

A trend towards the reintroduction of atherectomy has been observed (especially in the USA), as well as intravascular lithotripsy in patients with severe calcified newly-formed lesions as part of PCI treatment.

With regard to intravascular imaging, recent studies have shown consistently reduced rates of unwanted cardiovascular events if PCI is guided by intravascular ultrasound in comparison with interventions guided solely by angiography.

The first clinical study on the benefits of applying functional coronary angiography (noninvasive fractional flow reserve derived from coronary CT angiography) for guided PCI drew special attention, as it demonstrated reduced frequency of severe unwanted cardiovascular events when PCI was performed using this technology.

Increasing attention is being directed at atherosclerotic plaque, especially the presence of thin-cap fibroatheroma (TCFA) <65 µm in relationship to the functional assessment of stenosis significance. The *COMBINE OCT-FFR* study<sup>4</sup> demonstrated that the combination of negative FFR and presence of TCFA plaque had significantly higher incidence of unwanted cardiovascular events in comparison with negative FFR and TCFA plaque.

In the field of transcatheter therapy for aortic valve stenosis, a comparison was performed between the newest generations of different types of transcatheter biological valves (self-expandable vs. balloon-expandable), and no difference was found in the frequency of total unwanted cardiovascular events.

In contrast, “silent” ischemic brain damage was detected using magnetic resonance imaging in >80% of patients treated with transcatheter aortic valve implantation (TAVI). In order to prevent clinically significant and “silent” brain lesions, cerebral protection devices during TAVI were examined, but no clear benefit was found in their routine application, so they should be applied selectively at best.

Studies on the long-term comparative characteristics of TAVI and surgical aortic valve replacement (SAVR) in the population of low-risk patients with aortic valve stenosis showed

zala su da je sada TAVI postao terapijska opcija i za bolesnike niskog rizika s duljim očekivanim trajanjem života.

Recentne Smjernice ESC/EACTS-a<sup>5</sup> ističu važnost životne dobi bolesnika prilikom donošenja odluke o primjeni TAVI-ja ili SAVR-a, pri čemu je TAVI preporučeni bolesnicima u dobi  $\geq 75$  godina, neovisno o operativnom riziku, te asimptomatskim bolesnicima s teškom stenozom aortalnog zalistka i disfunkcijom lijeve klijetke (EF  $< 50\%$ ).

Na polju adjuvantne farmakoterapije u intervencijskoj kardiologiji istraživanja su pokazala dobit od skraćenoga trajanja dvojne antiagregacijske terapije u bolesnika s visokim rizikom od krvarenja podvrgnutih PCI-ju, ali uz potreban dodatni oprez u bolesnika s ACS-om.

Što se tiče antitrombotske terapije u bolesnika podvrgnutih TAVI proceduri, provedena ispitivanja upućuju na to da antitrombotična monoterapija treba ostati standardni terapijski režim kad ne postoji indikacija za DAPT ili sistemsku anti-koagulantu terapiju.

Zaključno bih htio naglasiti da je pred vama vrijedan pregledni članak<sup>1</sup> u kojemu je sjedinjeno obilje kliničkih ispitivanja iz gotovo svih područja intervencijske kardiologije. Nadam se da će vam koristiti u svakodnevnom radu i omogućiti postizanje što boljih rezultata uz što nižu stopu komplikacija, a sve sa svrhom pružanja najbolje i najsuvremenije medicinske skrbi našim bolesnicima.

that TAVI is now also a treatment option for patients with low risk with longer life expectancy.

Recent ESC/EACTS guidelines<sup>5</sup> emphasize the importance of patient age when deciding between TAVI and SAVR, with TAVI being recommended for patients aged  $\geq 75$  regardless of surgical risk as well as for asymptomatic patients with severe aortic valve stenosis and left ventricular dysfunction (EF  $< 50\%$ ).

Regarding adjuvant pharmacotherapy in interventional cardiology, studies have demonstrated the benefit of reduced duration dual antiplatelet therapy in patients with high risk of bleeding undergoing PCI, but with additional caution being necessary in ACS patients.

As for antiplatelet therapy in patients undergoing TAVI, studies have indicated that antiplatelet monotherapy should remain the standard treatment regimen when there is no indication for DAPT or systemic antiplatelet therapy.

In conclusion, I would like to emphasize that the review presented in this issue<sup>1</sup> is a valuable source of information that integrates a wealth of clinical studies from almost all fields in interventional cardiology. I hope you will find it useful in your everyday practice and that it will enable you to achieve the best treatment results with the lowest rate of complications, all with the goal of providing the best and most modern medical care for our patients.

## LITERATURE

1. Escaned J, Jaffer FA, Mehilli J, Mehran R. The year in cardiovascular medicine 2021: interventional cardiology. *Cardiol Croat.* 2022;17(3-4):59-72. <https://doi.org/10.15836/ccar2022.59>
2. Banning AP, Serruys P, De Maria GL, Ryan N, Walsh S, Gonzalo N, et al. Five-year outcomes after state-of-the-art percutaneous coronary revascularization in patients with de novo three-vessel disease: final results of the SYNTAX II study. *Eur Heart J.* 2022 Mar 31;43(13):1307-1316. <https://doi.org/10.1093/eurheartj/ehab703>
3. Fearon WF, Zimmermann FM, De Bruyne B, Piroth Z, van Straten AHM, Szekely L, et al; FAME 3 Investigators. Fractional Flow Reserve-Guided PCI as Compared with Coronary Bypass Surgery. *N Engl J Med.* 2022 Jan 13;386(2):128-137. <https://doi.org/10.1056/NEJMoa2112299>
4. Kedhi E, Berta B, Roleder T, Hermanides RS, Fabris E, IJsselmuiden AJJ, et al. Thin-cap fibroatheroma predicts clinical events in diabetic patients with normal fractional flow reserve: the COMBINE OCT-FFR trial. *Eur Heart J.* 2021 Dec 1;42(45):4671-4679. <https://doi.org/10.1093/eurheartj/ehab433>
5. Vahanian A, Beyersdorf F, Praz F, Milojevic M, Baldus S, Bauersachs J, et al; ESC/EACTS Scientific Document Group. 2021 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J.* 2022 Feb 12;43(7):561-632. <https://doi.org/10.1093/eurheartj/ehab395>