Koronarne intervencije u 2021. godini: iz nacionalnih kardioloških časopisa Europskog kardiološkog društva

Coronary interventions 2021: insights from the National Societies of Cardiology Journals of the European Society of Cardiology

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Nekoliko izazovnih pitanja glede vrlo velikog broja obavljenih perkutanih koronarnih intervencija (PCI) i mnogobrojnih kliničkih situacija u kojima se primjenjuju bila su tema istraživanja koja su publicirali nacionalni kardiološki časopisi Europskog kardiološkog društva (NSCJ).

Veliko španjolsko istraživanje pokazalo je da preživljenje bolesnika otpuštenih iz bolnice nakon primarne PCI zbog akutnog infarkta miokarda s elevacijom ST-segmenta (STEMI) bilo vrlo slično očekivanom trajanju života u široj populaciji s obzirom na dob[1]. Ipak, primijećeno je nekoliko razlika u uspješnosti PCI-ja i poslijedičnih ishoda. Žene uključene u nacionalni registar u Poljskoj imale su više proceduralnih komplikacija nakon rotacijske aterektomije te višu učestalost smrtnosti[2]. Veliko multinacionalno istraživanje provedeno u bolesnika s akutnim koronarnim sindromom (ACS) utvrdilo je slične razlike. Žene su bile starije od muškaraca, imale su više komorbiditeta, a revaskularizacija je u njih bila rjeđa nego u muškaraca. U usporedbi s muškarcima, veći je postotak žena umro tijekom praćenja[3]. Neuspjeh i komplikacije vezane uz PCI, prema rezultatima drugih velikih multinacionalnih istraživanja, također pogoršavaju kliničke ishode. Među bolesnicima s ACS-om bez elevacije ST-segmenta, 5 % njih je imalo barem jednu komplikaciju. Proceduralne komplikacije bile su povezane s ranom smrtnošću, akutnim infarktom miokarda (AMI) ili moždanim udarom[4]. Ipak, ohrabrujuće je da su se neu-

Several challenging issues with regards to the very large amount of percutaneous coronary interventions (PCI) performed and the numerous clinical settings they apply have been addressed by studies published in National Societies of Cardiology Journals (NSCJs).

A large Spanish study showed that survival of patients discharged from hospital after primary PCI for ST-elevation myocardial infarction (STEMI) is quite similar to an age-adjusted population life expectancy[1]. However, several differences in success of PCIs and subsequent outcomes have been observed across selected populations. Women included in a Polish nationwide registry have more procedural-related complications after rotational atherectomy and a higher mortality rate[2]. A large multinational survey of patients with ACS found similar differences. Women were older than men, with more co-morbidities and were less often revascularized. Compared with men, a higher percentage of women died during follow-up[3]. Failure and complications of PCI also worsen clinical outcomes of patients, as reported in another large multinational study. Among patients with a non-ST elevation ACS, 5 % experienced at least one complication. Procedural complications were associated with early mortality, acute myocardial infarction (AMI) or stroke[4]. More reassuringly, neurological complications following AMI decreased overtime, as reported by the SWEDEHEART registry. Within 10 years the relative risk of ischemic stroke was reduced by 20 % at 1-year post AMI. The re-

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rološke komplikacije nakon AMI-ja, prema rezultatima Registra *SWEDEHEART*, s vremenom smanjile. Tijekom 10 godina relativni rizik od ishemijskoga moždanog udara godinu dana nakon AMI-ja smanjio se za 20 %. To se smanjenje poklapa s promjenom reperfuzijske strategije za STEMI iz trombolitičke terapije u primarnu PCI, te povećanom uporabom lijekova u sekundarnoj prevenciji, temeljeno na dokazima iz Smjernica Europskoga kardiološkog društva (ESC)[5].

Invazivna fiziološka evaluacija koronarnih lezija s pomoću frakcijske rezerve protoka (FFR), koja se sve više primjenjuje, i dalje je razlog za oprez. Retrospektivna analiza PCI postupaka provedena u dvama centrima s velikim volumenom bolesnika u Portugalu pokazala je da se PCI primjenjivala u malog broja bolesnika ili sa stabilnom bolesti koronarnih arterija (CAD) ili samo s ACS-om. Ipak, objava Smjernica ESC-a za revaskularizaciju miokarda iz 2014. bila je popraćena dvostrukim povećanjem primjene ovih postupaka[6]. Korisnost od iFR-a (prema engl. *instantaneous wave-free ratio*) evaluirana je s pomoću novorazvijenog programa *Syncvision* kojim se istraživao postupak odlučivanja kod dugačkih, difuznih ili sekvencijskih lezija. Slični rezultati glede ishoda, uključujući smrtnost, AMI, trombozu stenta i revaskularizaciju ciljnih žila (TVR), također su potvrdili sigurnost ovoga pristupa[7].

Distalni radijalni pristup za PCI teži je nego konvencionalni radijalni pristup. U Turskoj u bolesnika s ACS-om nije pronađena razlika u uspješnosti između tih dvaju pristupa, no distalni je pristup bio povezan s manjom učestalošću radijalnog spazma i radijalne okluzije[8]. Prema Smjernicama ESC-a iz 2018., pri stenozi debla (LM) sve se češće primjenjuje PCI, i to nakon pažljive stratifikacije lezija primjenom *SYNTAX* bodovanja. U bugarskom istraživanju s rezultatima iz stvarne kliničke prakse uspješna maksimalna revaskularizacija postignuta je nakon nezaštićene PCI LM u svih bolesnika, uz samo nekolicinu nepovoljnih kliničkih ishoda tijekom kasnijega praćenja[9]. PCI LM bifurkacijske lezije nosi neželjeni rizik od zatvaranja postranične grane. U drugom je istraživanju provedena usporedba dviju različitih strategija za privremene intervencije u postraničnoj grani. Kod „nepravih" bifurkacijskih lezija primijenjena je tehnika uporabe jednog stenta s (agresivna strategija) obveznom inflacijom dvaju balona u objema granama ili bez nje (konzervativna strategija). Kod „pravih" bifurkacijskih lezija elektivna tehnika koja uključuje uporabu dvaju stentova (agresivna strategija) uspoređena je s uporabom jednog stenta popraćena postupnom inflacijom / stentom dodatnog balona ovisno o rezidualnoj stenozi postranične grane (konzervativna strategija). Agresivne i konzervativne strategije za privremeni stent postranične grane imale su slične rezultate glede jednogodišnje TVR[10].

Egipatsko istraživanje provedeno u bolesnika sa STEMI-jem i potpuno okludiranom arterijom kao uzročnom lezijom i teškim trombotskim opterećenjem uspoređivala je ishode u bolesnika u kojih je aspiracija tromba učinjena ili nije učinjena. Aspiracija tromba bila je povezana s boljim TIMI protokom, *myocardial blush gradeom,* rezolucijom ST-segmenta te sa smanjenom jednomjesečnom smrtnošću[11].

Prema Smjernicama ESC-a o revaskularizaciji miokarda iz 2018., pri kroničnoj totalnoj okluziji (CTO) PCI se sve više provodi koristeći se preporučenim izračunom prema *SYNTAX* bodovanju. Takva povišenja stopa bodovanja najjasnije se vidi u multicentričnom istraživanju iz Belgije i Luksemburga, u kojemu je postupcima tehnički uspjeh postignut u

duction coincides with the shift of reperfusion therapy from thrombolysis to primary PCI for STEMI and the increased use of evidence-based secondary preventive therapy according to the ESC guidelines[5].

Invasive physiological assessment of coronary lesions with fractional flow reserve (FFR), which is increasingly used, remains a subject of concern. A retrospective analysis of PCI performed in two large volume centers in Portugal showed that it was performed in few patients with either stable CAD or ACS only. However, the release of the 2014 ESC guidelines on myocardial revascularization was followed by 2-fold increase in its adoption[6]. The usefulness of instantaneous wave-free ratio (iFR) was assessed using the newly developed Syncvision software to guide the iFR-pullback study and the final decision-making process in long, diffuse, or sequential lesions. Similar results with regards to outcomes of patients, including mortality, AMI, stent thrombosis and target vessel revascularization (TVR) confirmed the safety of this approach too[7].

Distal radial access for PCI is more difficult than conventional radial access. A Turkish study among patients with ACS found no difference between the success rate of both approaches, but distal access was associated with fewer rates of radial spasm and radial occlusion[8]. According to the 2018 ESC guidelines, PCI for left main (LM) stenosis is increasingly performed after careful staging of lesions using the SYNTAX score. In a study from Bulgaria showing real world results, successful maximal revascularization was obtained after unprotected PCI of LM in all patients with only few unfavorable clinical outcomes during follow up[9]. PCI of LM bifurcation lesions carries a harmful risk of side-branch closure. Two different strategies for provisional side branch interventions have been compared in another study. For non-true bifurcation lesions, a 1-stent technique with (aggressive strategy) or without (conservative strategy) mandatory kissing balloon inflation was applied. For true bifurcation lesions, an elective 2-stent technique (aggressive strategy) was compared to a 1-stent approach followed by a stepwise additional balloon inflation/stenting depending on the residual stenosis of the side branch (conservative strategy). Aggressive and conservative strategies for a side branch provisional stenting had similar results with regards to 1-year TVR[10].

An Egyptian study of patients with STEMI and totally occluded culprit-lesion artery by a heavy thrombus burden compared outcomes of patients in whom thrombus aspiration was performed or not. Thrombus aspiration was associated with better TIMI flow, myocardial blush grade and ST-segment resolution and with reduced 1-month mortality rates[11].

According to the 2018 ESC guidelines on myocardial revascularization, PCI for chronic total occlusions (CTOs) has increasingly been performed using the recommended calculation of the SYNTAX score. This increased rate was clearly seen in a multicenter study from Belgium and Luxembourg in which procedures achieved technical success in 80 % of cases. High-volume centers progressively tackled more complex CTOs while keeping success rates stable overtime[12]. Another issue of concerns pertains to aorto-ostial CTOs since they are often associated with unfavorable anatomic characteristics and unclear vessel course. Procedural success was achieved in 78 % PCI of aorto-ostial CTOs among patients included in a large multinational study. There were only few procedural complications. During follow-up, subsequent TVR and cardiovascular mortality rate remained very low[13].

Treatment of in-stent restenosis is another challenging anatomic scenario. In a 3-year clinical follow-up of patients presenting with bare-metal stent (BMS) in-stent restenosis, a study from

80 % slučajeva. Visokovolumni centri postupno povećavaju broj kompleksnih CTO postupaka, održavajući stopu uspjeha stabilnom[12]. Još jedno važno pitanje odnosi se na aortalnoostijalni CTO jer su postupci povezani s nepovoljnim anatomskih karakteristikama i nejasnim ishodom na žilama. Proceduralni uspjeh postignut je u 78 % PCI-ja kod aortalnoostijalne CTO među bolesnicima uključenima u veliko multinacionalno istraživanje. Primijećeno je samo nekoliko komplikacija. Tijekom praćenja su TVR i kardiovaskularna smrtnost ostale vrlo niske[13].

Liječenje restenoze unutar stenta još je jedan izazovan problem. U trogodišnjem kliničkom praćenju bolesnika s restenozom unutar metalnoga stenta istraživanje iz Češke Republike pokazalo je povoljnije ishode u bolesnika liječenih balonima obloženima iopromidom i paclitaxelom u usporedbi s onima liječenim *seal-wing* paclitaxel-otpuštajućim balonima. Značajni kardiološki neželjeni događaji i potreba za TVR-om bili su prisutni u dvostruko, odnosno trostruko manje bolesnika[14].

Istraživanje u jednom centru u Turskoj objavilo je rezultate glede istodobne primjene ili izostavljanja PCI-ja tijekom transkateterske implantacije aortalnog zalistka (TAVI). Postproceduralne komplikacije, uključujući perikardijalni izljev, moždani udar, ozbiljne vaskularne komplikacije, krvarenje i hitne aritmije bile su slične u bolesnika u kojih je koronarna revaskularizacija bila provedena istodobno i u onih u kojih je provedena prije ili nakon TAVI-ja. Iako je smrtnost unutar 30 dana bila viša kod istodobne nego kod kasnije ili ranije koronarne revaskularizacije, nije bilo statističke razlike u jednogodišnjoj stopi smrtnosti[15].

Još jedno novo polje za perkutane postupke odnosi se na bolesnike s refraktornom anginom u kojih revaskularizacija nije primjerena. Koronarni sinusni smanjivač namijenjen je za smanjivanje simptoma. U petogodišnjem nizozemskom istraživanju dvije trećine bolesnika u kojih je taj uređaj ugrađen imala je poboljšanje od barem jedne klase prema Kanadskom kardiovaskularnom društvu (CSS), a oko polovice njih imalo je poboljšanje od bar 2 CCS klase[16].

S obzirom na to da je nedavno na svinjskom modelu pokazano da metoprolol smanjuje progresiju ishemijske ozljede za STEMI, provedena je i procjena tog učinka u bolesnika sa STEMI-jem. U usporedbi s kontrolnom skupinom, bolesnici koji su primili iv. metoprolol prije reperfuzije imali su uži QRS kompleks, nižu zastupljenost distorzije QRS-a te niži zbroj elevacije ST-segmenta, što upućuje na to da metoprolol potencijalno umanjuje ishemijske ozljede. Poboljšanje u elektrokardiografskim parametrima vezano uz metoprolol koreliralo je s poboljšanjem u varijablama oslikavanja magnetnom rezonancijom glede veličine infarkta, koronarnih mikrovaskularnih opstrukcija te funkcije lijeve klijetke[17].

Publikacije o PCI-ju koje je objavio NSCJ nude uvide iz kliničke prakse o evoluciji novih izazova u liječenju bolesnika s CAD-om u zemljama čija su kardiološka društva dio ESC-a. Naglašavaju se napredci u ovom dinamičnom polju što se tiče razvoja proceduralnih unaprjeđenja i načina na koji se smjernice ESC-a postupno uvode i primjenjuju u kliničkoj praksi.

Czech Republic showed more favorable outcomes in patients treated with iopromide paclitaxel-coated balloons as compared with those treated with seal-wing paclitaxel-eluting balloons. Major cardiac adverse events and the need for TVR were seen in 2- and 3-fold fewer patients, respectively[14].

A single center study from Turkey reported the results on concomitant PCI or not in transaortic valve implantation (TAVI). Postprocedural complications including pericardial effusion, stroke, major vascular complications, bleeding, and emergency arrhythmias were similar in patients in whom coronary revascularization was performed simultaneously or performed as a staged procedure before or after TAVI. Although 30-day mortality was higher in simultaneously performed than in staged coronary revascularization, 1-year mortality rates were not statistically different[15].

Another new field for percutaneous procedures relates to patients with refractory angina in whom revascularization is not suitable. The coronary sinus reducer (CSR) is intended to relief these disabling symptoms. Among patients in whom the device was implanted in a 5-year Dutch experience, two third of them showed improvements of at least 1 Canadian Cardiovascular Society (CCS) class, and about one half in at least 2 CCS class[16].

As metoprolol was recently shown to reduce progression of ischemic injury in a pig model of STEMI, this effect was assessed in patients with ongoing STEMI. Compared with controls, those who received IV metoprolol before reperfusion had narrower QRS, a lower prevalence of QRS distortion, and a lower sum of ST-elevation, suggesting that IV metoprolol may reduce ischemic injury. The improvement by metoprolol in the ECG parameters correlated with improvement in magnetic resonance imaging (MRI) parameters of infarct size, coronary microvascular obstruction, and left ventricular function[17].

Publications on PCI released by NSCJs provide real world insights on the current evolving challenges in management of patients with CAD across countries whose national cardiac societies are affiliated to the ESC. They highlight the advancements taking place in this dynamic field with ongoing procedural improvements and how ESC guidelines are progressively adopted and implemented in a real-world setting.

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