

Almanah 2015.: Istraživanja o fibrilaciji atrijske u časopisu *Heart*

Almanac 2015: atrial fibrillation research in *Heart*

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RECEIVED:
February 2, 2016

ACCEPTED:
February 3, 2016



CITATION: *Cardiol Croat.* 2016;11(5-6):162–175. | DOI: <http://dx.doi.org/10.15836/ccar2016.162>

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SAŽETAK: Fibrilacija atrijske (FA) ne prestaje biti predmet zanimanja kardiovaskularne zajednice i časopisa *Heart*. U 2014. i 2015. godini u *Heartu* je objavljeno više od 60 istraživanja i preglednih članaka o raznim oblicima FA, od pridruženih stanja i trigerirajućih čimbenika do novih pristupa liječenju. Ovdje sažimamo članke o FA-u objavljene u *Heartu* tijekom 2014. i 2015. godine, uz naglasak na novim istraživanjima, idejama i pristupima liječenju.

SUMMARY: Atrial fibrillation continues to attract interest in the cardiovascular community and in *Heart*. Over 60 original research and review papers published in *Heart* in 2014–2015 cover various aspects of atrial fibrillation, from associated conditions and precipitating factors to new approaches to management. Here, we provide an overview of articles on atrial fibrillation published in *Heart* in 2014–2015, highlighting new developments, emerging concepts and novel approaches to treatment.

Prijevod teksta: Stjepan Marušić.

Prijevod uredili: Ivica Premužić Meštrović i Mario Ivanuša. Lektorirao: Tomislav Salopek.

BMJ nije odgovoran za točnost prijedora teksta.

Translation: Stjepan Marušić.

Translation edited by: Ivica Premužić Meštrović and Mario Ivanuša. / Language editing: Tomislav Salopek.

BMJ takes no responsibility for the accuracy of the translation.

First published in *Heart* [*Heart*. 2016;102:573–580. DOI: <http://dx.doi.org/10.1136/heartjnl-2015-307809>] and reproduced with permission. Copyright restrictions apply.

Uvod

U 2014. i 2015. godini provodilo se intenzivno istraživanje o fibrilaciji atrijske (FA), pri čemu je doprinos časopisa *Heart* na tom području bio iznimno bitan i sadržajan. Članci objavljeni u tom vremenskom rasponu prikazuju raznolikost izazova s kojima se suočavaju pacijenti s FA-om i njihovi liječnici, od čimbenika koji omogućuju procjenu rizika od kardiovaskularnih komplikacija, preko novih hipoteza koje proizlaze iz veza između FA i biomarkera do uvida u optimalni pristup antikoagulantnoj terapiji te terapiji kontrole frekvencije i ritma srca. Sažeti su neki od najzanimljivijih otkrića objavljenih o FA u časopisu *Heart* u 2014. i 2015. godini.

Introduction

The 2014–2015 have been active years in atrial fibrillation (AF) research. Contributions from *Heart* on this subject have been very significant and substantial. The articles reflect the diverse nature of problems that patients with AF and their physicians are faced with, ranging from factors that allow to estimate the risk of cardiovascular complications and novel, hypothesis-generating associations of AF with biomarkers to insights into the optimal approach to anticoagulation, rate control and rhythm control therapy. We summarise some of the more interesting findings reported on AF in *Heart* in the year 2014 and 2015.

Rizični čimbenici za nastanak i progresiju fibrilacije atrijske

POČETNI ELEKTROKARDIOGRAM, FREKVENCIJA SRCA I ŽIVOTNA DOB

Kako bi se utvrdio rizik od napredovanja, od paroksizmalne, preko perzistentne do permanentne FA, analizirani su podaci više od 6000 pacijenata iz registra Sjedinjenih Američkih Država (ORBIT-AF; *Outcomes Registry for Better Informed Treatment of Atrial Fibrillation*).¹ Utvrđeno je da su porast dobi za 10 godina (OR 1,16) i prisutnost FA u početnom elektrokardiogramu (EKG) (OR 2,30) snažni prediktori progresije FA. Istodobno je smanjenje frekvencije srca na < 80/min (OR 0,84) štitilo od progresije FA.

IVABRADIN

Važna metaanaliza identificirala je malen, no značajan rizik (relativni rizik – RR 1,15) za nastanak FA u pacijenata liječenih ivabradinom.² Taj je učinak slučajno otkriven upravo u skupini pacijenata (početna frekvencija > 70/min) koji imaju najveću dobit od liječenja ivabradinom u smislu smanjene učestalosti bolničkog liječenja. Taj bi se relativni rizik za nastanak FA mogao pripisati promjeni u struji I_f potaknutoj ivabradinom, promjeni potencijala membrane u mirovanju ili mogućim proaritmjskim učincima bradikardije. Potrebno je provesti nove studije kako bi se identificirali mehanizmi kojima ivabradin uzrokuje FA (slika 1).

DIJASTOLIČKA DISFUNKCIJA

Rezultati subanalize *Tromsø* studije iz Norveške pokazali su da je znatno povećanje veličine atrijske kao markera dijastoličke disfunkcije jedina ehokardiografska varijabla povezana s rizikom od nastanka FA (HR 4,2).³ Taj je podatak bio neovisan o drugim varijablama dijastoličke disfunkcije mitralnog zastlaka utvrđenih doplerskom analizom. Veličina lijevog atrijske

Risk factors for developing AF and AF progression

BASELINE ECG, HEART RATE AND AGE

A US-based registry (ORBIT -AF Outcomes Registry for Better Informed Treatment of Atrial Fibrillation.) analysed more than 6000 patients for risk of progression of AF from paroxysmal to persistent to permanent.¹ It was found that increasing age by 10 (OR 1.16) and presence of AF in ECG at baseline (OR 2.30) were strong predictors of AF progression. Meanwhile, decreasing heart rate than 80 (OR 0.84) was protective against progression of AF.

IVABRADINE

An important meta-analysis identified a small (relative risk (RR) 1.15) but relevant risk for developing AF in patients treated with ivabradine.² This effect is incidentally observed in the same group of patients (baseline heart rate >70) that get the highest benefit from receiving ivabradine in terms of decreasing hospitalisation. This RR of developing AF could be attributed to change in the I_f current induced by ivabradine, a modification of the atrial resting membrane potential, or due to the potential proarrhythmic effects of bradycardia. Mechanistic studies are warranted to identify the mechanisms of AF induction by ivabradine (Figure 1).

DIASTOLIC DYSFUNCTION

Results of subanalysis from *Tromsø* Study in Norway showed that severely enlarged atrial size as a marker for diastolic dysfunction was only echocardiographic marker associated with risk of developing AF (HR 4.2).³ This was independent of other mitral valve Doppler indices of diastolic dysfunction. Left atrial (LA) size increases with increasing diastolic dysfunction due to long-term change in left heart flow dynamics.

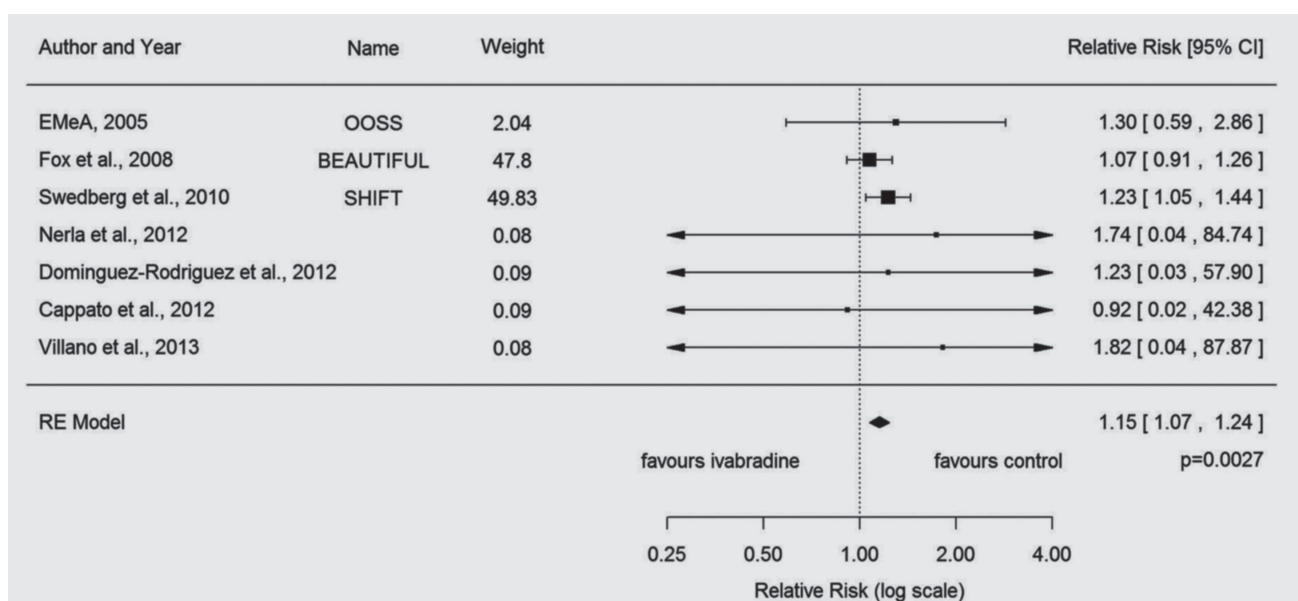


FIGURE 1. Forest Plot of RR of atrial fibrillation with ivabradine.² RR, relative risk.

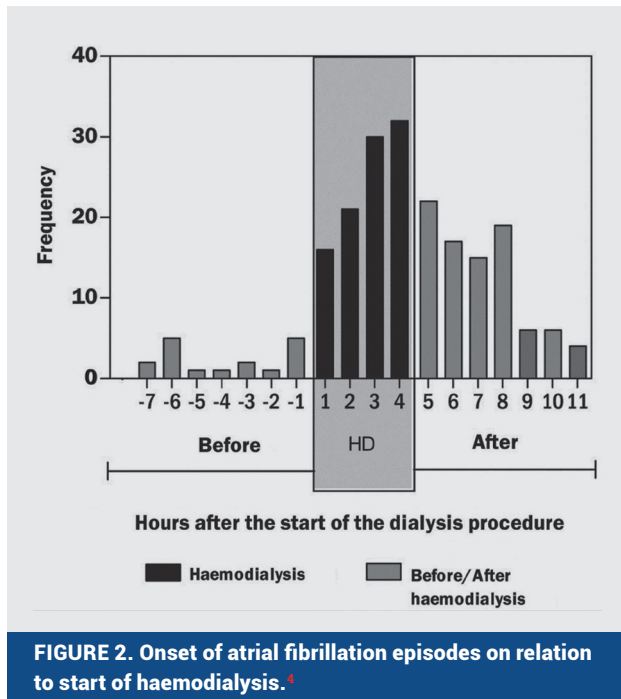


FIGURE 2. Onset of atrial fibrillation episodes on relation to start of haemodialysis.⁴

(LA) povećava se porastom dijastoličke disfunkcije zbog dugoročnih hemodinamskih promjena lijeve strane srca.

HEMODIJALIZA

Analiza podataka kohorte pacijenata na dijalizi s ugrađenim elektrostimulatorom ili defibrilatorom upućuje na to da sam postupak hemodijalize može dovesti do nastupa FA-a.⁴ Nastup poremećaja atrijskog ritma visoke frekvencije (AHRE; prema eng. *atrial high-rate event clusters*) oko vremena dijalize može se smatrati posrednim mjerilom za FA. Kao pokretač FA-a smatra se odnos između većega udarnog volumena i niže koncentracije kalija u tekućini za dijalizu. Istodobno, u pacijenata na peritonejskoj dijalizi bilo je registrirano manje epizoda FA-a. Navedeni se rezultati poklapaju i s rezultatima drugih studija koje uzimaju u obzir životnu dob, spol, koronarnu bolest srca i dimenzije atrija kao dodatne čimbenike rizika za razvoj FA-a u bolesnika na hemodijalizi (slika 2).^{5,6}

TJELOVJEŽBA

Nekoliko je objavljenih članaka istraživalo utjecaj tjelovježbe na rizik od nastanka FA-a.^{7,8} U jednoj švedskoj studiji provedenoj u više od 44 000 zdravih odraslih muškaraca pokazan je odnos u obliku slova „U” između vježbanja i rizika od FA-a.⁹ Prema tim rezultatima, umjereno do znatno vježbanje u slobodno vrijeme ili vožnja biciklom/hodanje više od 60 minuta na dan povezani su s RR 1,17 odnosno 1,04 za razvoj FA-a poslije tijekom života. Zanimljivo je da je taj trend obrnut u starijoj dobi, kada slična razina vježbanja dovodi do smanjenja RR-a. Slični pozitivni trendovi tjelovježbe primijećeni su i u sredovječnih i starijih žena.¹⁰

Dobro je poznato da se sposobnost vježbanja smanjuje u pacijenata s prisutnom FA, neovisno o tome je li ili nije smanjena sistolička funkcija lijeve klijetke.^{11,12} Postoji pretpostavka

HAEMODIALYSIS

A hypothesis-generating analysis of a cohort of dialysis patients with an implanted pacemaker or defibrillator suggested that the haemodialysis procedure itself could trigger AF.⁴ The onset of atrial high-rate events (AHRE) clusters around the time of dialysis that can be considered as a proxy measure for AF. An association between higher exacted volume and lower dialysate potassium concentration is considered as triggers of AF. Comparatively, patients receiving peritoneal dialysis had less episodes of AF. These findings are consistent across other studies, which includes age, gender, coronary artery disease and atrial dimensions as additional risk for developing AF in haemodialysis patients (Figure 2).^{5,6}

EXERCISE

Several papers have assessed the impact of physical exercise on risk of developing AF.^{7,8} There was an interesting Swedish study in more than 44 000 healthy adult men demonstrating a U-shaped relation between exercise and risk of AF.⁹ They found that moderate-to-severe exercise in leisure time or bicycling/walking for more than 60 min in a day was associated with a RR of 1.17 and 1.04 of developing AF later in life. Interestingly, this trend is seen to reverse in the older age with reduction in RR with similar levels of exercise. Similar favourable trends of exercise are seen for middle-aged and elderly women.¹⁰

It is well established that exercise capacity is reduced in AF with or without the presence of left ventricular systolic impairment.^{11,12} There is a suggestion that paroxysmal atrial fibrillation (PAF) could add to the interplay between exercise and inherited conditions such as hypertrophic cardiomyopathy.¹³ Patients with PAF had a substantially lower exercise tolerance, even though they remained in Sinus Rhythm (SR) during exercise testing. After adjustment for age, sex and body mass index, PAF still had an independent RR of 4.65 for reduced exercise tolerance.

NO BENEFIT OF ATRIAL SEPTAL DEFECT CLOSURE

A Danish study for adult patients diagnosed with Atrial septal defect (ASD) shows that ASD closure gives rise to a higher risk of new AF (HR 8.4) as compared with age and gender matched comparison cohort, with a 10 year cumulative incidence of 11%.¹⁴ The risk of stroke was higher in patients with ASD with (HR 2) or without (HR 2.6) ASD closure, suggesting that AF is not prevented by ASD closure. This observation suggests that other factors than the altered haemodynamic function determine AF in patients with ASD. Alternatively, an even earlier timing of ASD closure may be needed to prevent AF.

OTHER HYPOTHESIS-GENERATING ASSOCIATIONS WITH AF

An analysis of Myocardial Ischemia National Audit Project database covering all PCI Percutaneous Coronary Intervention procedures in England and Wales for the short-term effects of air pollution on cardiovascular events in England and Wales was published in 2014.¹⁵ This showed an increased risk of hospital admissions due to AF and arrhythmias and high levels of NO₂. A high content of particulate matter less than

da je paroksizmalna fibrilacija atrija (FAP) poveznica između vježbanja i prirodnih stanja, kao npr. hipertrofijske kardiomiopatije.¹³ Pacijenti s FAP-om imaju smanjenu toleranciju na vježbanje usprkos tomu što ostaju u sinusnom ritmu tijekom ergometrijskog testiranja. Nakon korekcije za životnu dob, spol i indeks tjelesne mase, FAP je i dalje imala neovisni RR od 4,65 za smanjenu toleranciju napora.

IZOSTANAK DOBROBITI ZATVARANJEM ATRIJSKOGA SEPTALNOG DEFEKTA

Danska studija provedena na odrasloj populaciji pacijentima s atrijskim septalnim defektom (ASD) pokazala je da zatvaranje ASD-a dovodi do povišenog rizika za razvoj FA-a (HR 8,4) u usporedbi s kontrolnom skupinom jednakom prema dobi i spolu, uz ukupnu incidenciju od 11 % tijekom razdoblja od 10 godina.¹⁴ Rizik od moždanog udara bio je viši u pacijenata s ASD-om neovisno o tome je li on zatvoren (HR 2) ili nije (HR 2,6), što upućuje na to da se FA ne sprječava zatvaranjem ASD-a. To pokazuje da FA u pacijenata s ASD-om nije posljedica hemodinamskih promjena, nego prisutnosti drugih čimbenika. Alternativno, moguće je da bi se još ranijim zatvaranjem ASD-a spriječio nastup FA-a.

OSTALE HIPOTETSKE POVEZNICE S FIBRILACIJOM ATRIJA

U 2014. godini objavljeno je istraživanje o kratkoročnom učinku onečišćenog zraka na pojavu kardiovaskularnih događaja na temelju analize baze podataka *Myocardial Ischemia National Audit Project* o svim učinjenim perkutanim koronarnim intervencijama (PCI; prema eng. *percutaneous coronary intervention*) u Engleskoj i Walesu.¹⁵ Studija je pokazala da pri izloženosti visokim razinama NO₂ postoji povišeni rizik od bolničkog prijma zbog FA i aritmija. Visoka zastupljenost čestica u zraku promjera < 2,5 μm povezana je s povećanom smrtnosti sekundarno – zbog FA, aritmija ili plućne embolije.

Opservacijska studija o riziku razvoja undulacije atrija i FA u pacijenata hospitaliziranih zbog perikarditisa pokazala je incidenciju od 4,3 %, pri čemu se više od 90 % epizoda FA-a pojavljuje tijekom prva 24 sata.¹⁶ U svih je pacijenata uspostavljen sinusni ritam. Međutim, u 35 % pacijenata razvila se nova epizoda unutar 3 mjeseca. Autori predlažu primjenu antikoagulacijske terapije u visokorizičnih pacijenata. Nije dokazan povećani rizik od tamponade srca tijekom antikoagulacijske terapije.

Biomarkeri za fibrilaciju atrija

U posljednje su vrijeme biomarkeri predmet interesa u smislu predviđanja, dijagnoze i prognoziranja rizika za FA.¹⁷⁻²⁰

TROPONIN I, NATRIJURETSKI PEPTIDI I RAZINA NOREPINEFRINA

Podstudija istraživanja RE-LY (*Randomized Evaluation of Long-term anticoagulant Therapy*), koja se bavila prognostičkim vrijednostima biomarkera te njihovom uporabom pri stratifikaciji rizika za FA, upozorila je na mogućnost primjene srčanih biomarkera.²¹ Kontinuirano visoke vrijednosti troponina I (cTnI) i N-terminalnog moždanog natrijuretskog peptida (NT-proBNP) povezane su s visokom učestalosti moždanog udara, sustavnog embolizma (HR 4,54) te vaskularne smrti (HR 8,62).

2.5 μm in diameter was associated with increased mortality secondary to AF, arrhythmia and pulmonary embolism.

An observational study for risk of developing atrial flutter and fibrillation in patients admitted with pericarditis showed an incidence rate of 4.3% with more than 90% having an episode of AF in the first 24 h.¹⁶ All of them reverted to sinus rhythm. However, there was 35% 3 month recurrence rate for patients who initially developed AF. The authors advocated for anticoagulation in high-risk patients. No increased risk of pericardial tamponade with anticoagulant therapy was shown.

Biomarkers in AF

Biomarkers have recently generated a lot of interest in prediction, diagnosis and prognostic risk stratification of AF.¹⁷⁻²⁰

TROPONIN I, NATRIURETIC PEPTIDES AND NOREPINEPHRINE LEVELS

An substudy of RE-LY (*Randomized Evaluation of Long-term anticoagulant Therapy*) regarding the prognostic value and risk stratification of biomarkers in AF has indicated an interesting use of cardiac biomarkers.²¹ They have indicated that serial high levels of cardiac troponin I (cTnI) and N Terminal-pro Brain Natriuretic Peptide (NT-proBNP) are associated with high incidence of stroke and systemic embolism (HR 4.54) and vascular death (HR 8.62). Others have earlier found similar association between these biomarkers and prognosis in AF.²²⁻²⁵ A Japanese study showed higher levels of atrial natriuretic peptide, brain natriuretic peptide and norepinephrine (NE) in persistent versus PAF.²⁶ Only elevated NE levels were found to have an association with sick sinus syndrome (**Figure 3**).

LIVER ENZYMES

Elevated circulating levels of liver enzymes are found to have moderately strong association with increased AF incidence in a large prospective community-based cohort study of more than 15 000 subjects.²⁷ The association was linear and strongest for gamma glutamyl transferase (GGT) with doubling of GGT levels leading to 20% increase in AF risk after adjusting for the confounding factors. The association of AF incidence and aspartate amino transferase (AST) and to a lesser extent alanine amino transferase (ALT) showed a U-shaped curve with maximum incidence at the two extremes. This can be explained by right-sided heart failure leading to hepatic congestion or non-alcoholic fatty liver disease that increases the cardiovascular risk due to effect on glucose and lipid metabolism²⁸⁻³⁰ Correlation between deranged LFTs and risk of cardiovascular disease has also been published in a subanalysis from Framingham heart study.³¹

ADIPONECTIN

An association as a function of increasing age was seen between higher circulating adiponectin levels and risk of developing AF.³² This is paradoxical to the contemporary belief that higher adiponectin levels are cardioprotective. Further work is required in this field to identify a clear association with this novel biomarker.

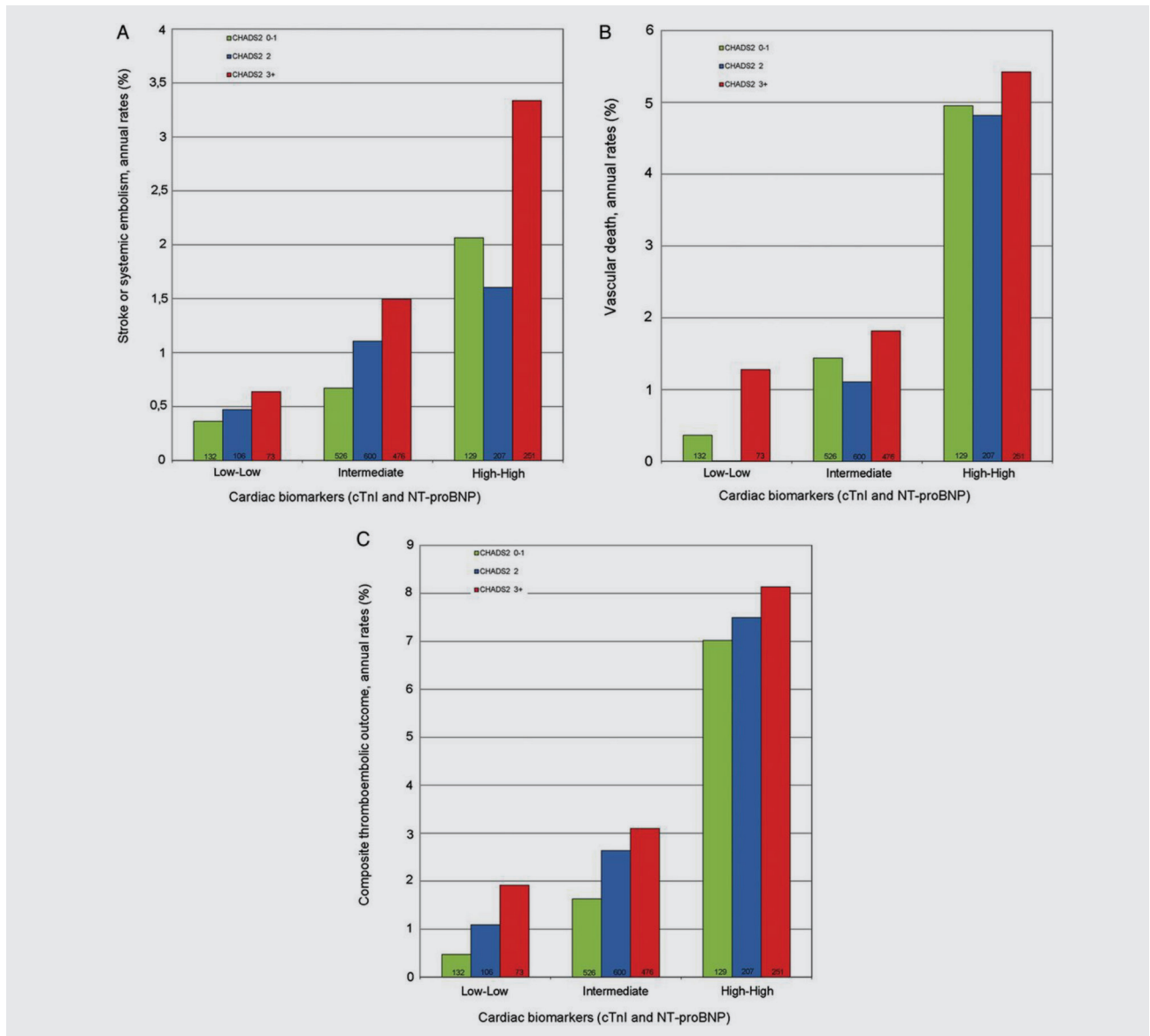


FIGURE 3. Study endpoints in relation to combined cardiac biomarker levels and CHADS₂ score. Stroke or systemic embolism (A), vascular death (B) and composite thromboembolic outcome consisting of ischaemic stroke, systemic embolism, myocardial infarction, pulmonary embolism and vascular death (C).²¹ cTnI, cardiac troponin. NT-pro BNP, N Terminal-pro Brain Natriuretic Peptide. CHADS₂, Stroke score (based on a 1 point each for Congestive heart failure, Hypertension, Age more than 75, Diabetes mellitus and 2 points for previous Stroke or TIA).

Sličnu povezanost među navedenim biomarkerima s prognozom FA prije su pronašle i druge studije.²²⁻²⁵ Japanska je studija pronašla više razine atrijskoga natrijetskog peptida, moždanog natrijetskog peptida i norepinefrina (NE) u trajnoj FA u usporedbi s FAP-om.²⁶ Samo je povišena razina NE povezana sa sindromom bolesnoga sinusnog čvora (**slika 3**).

JETRENI ENZIMI

Prema velikoj prospektivnoj kohortnoj studiji s više od 15 000 uključenih sudionika povišena vrijednost jetrenih enzima u serumu dovodi do umjereno povišene incidencije FA-a.²⁷ Povezanost je bila linearna te najizraženija za gama-glutamil transferazu (GGT), gdje je podvostručenje razine GGT-a dovelo do

Epidemiology and risk factors

INCREASING INCIDENCE OF AF IN THE UK

A large population-based cohort study looked at the discharge record of 2.2 million individuals aged 45 and above, from UK Clinical Practice Research Datalink.³³ They found more than 91 000 incident AF cases. The incidence of AF has increased from 5.9/1000 person-years in 2001 to 6.9/1000 person-years in 2013. The overall incidence in terms of 1000 person-years increases with increasing age (25.1 for patients between 80–89) and is also higher for Caucasians (8.1) versus Asians (5.4) and African Americans (4.6).

20 % većeg rizika nakon korekcije pridruženih čimbenika. Povezanost incidencije FA i aspartat aminotransferaze (AST) te u manjoj mjeri alanin aminotransferaze (ALT) imala je oblik krivulje u obliku slova „U“, uz maksimalnu incidenciju na dvama ekstremima. To se može objasniti desnostranim srčanim zatajivanjem koje dovodi do hepatalne kongestije ili nealkoholne masne jetre, što povećava kardiovaskularni rizik zbog učinaka na metabolizam glukoze i lipida.²⁸⁻³⁰ U podanalizi *Framingham Heart Study* također je nađena korelacija između poremećaja jetrene funkcije i rizika od kardiovaskularne bolesti.³¹

ADIPONEKTIN

Dokazana je povezanost između povećanja životne dobi koju prate povišene razine cirkulirajućeg adiponektina s rizikom od nastanka FA-a.³² To jest kontroverzno s obzirom na trenutno uvjerenje da su više razine adiponektina kardioprotektivne. Potrebna su daljnja istraživanja u ovom području kako bi se odredila jasna povezanost ovog, novog biomarkera.

Epidemiologija i rizični čimbenici

RASTUĆA INCIDENCIJA FIBRILACIJE ATRIJA U UJEDINJENOM KRALJEVSTVU

Velika kohortna studija na temelju baze podataka *UK Clinical Practice Research Datalink* istraživala je podatke s otpusnih pisama 2,2 milijuna pojedinaca starijih 45 i više godina.³³ Registrirano je više od 91 000 slučajeva FA-a. Incidencija FA-a porasla je s 5,9/1000 u 2001. na 6,9/1000 osoba godišnje u 2013. godini. Ukupna incidencija u slučajevima na 1000 osoba godišnje raste s obzirom na dob (25,1 za pacijente dobi od 80 do 89 godina) te je veća za bijelce (8,1) u usporedbi s osobama azijskog (5,4) i afričkog (4,6) porijekla.

PREDIKTIVNA VRIJEDNOST CHADS₂ I CHA₂DS₂Vasc BODOVNI SUSTAVI ZA KARDIOVASKULARNA DOGAĐANJA U PACIJENATA BEZ FIBRILACIJE ATRIJA

CHADS₂ i CHA₂DS₂Vasc bodovni sustavi validirani su kao pokazatelji rizika moždanog udara u pacijenata s FA-om.^{34,35} Također su u jednoj studiji rabljeni za procjenu rizika od nastanka novoga moždanog udara/transizitornog ishemijskog napadaja u pacijenta s akutnim koronarnim sindromom (AKS) koji nemaju FA.³⁶ Oba su bodovna sustava ovdje podjednako dobro predviđjela godišnji rizik za razvoj moždanog udara/TIA-a s apsolutnom godišnjom incidencijom od 1 % pri CHADS₂ zbroju ≥ 3 i CHA₂DS₂Vasc ≥ 4 . Rezultati se podudaraju s istraživanjima *Poci i sur.* koji su pronašli povezanost CHADS₂ s mortalitetom i moždanim udarom. Drugi su istraživači također upozorili na povezanost tih bodovnih sustava sa smrtnošću nakon moždanog udara, rizikom od nastanka nove FA, rizikom od moždanog udara ili smrti nakon aortokoronarnog premoštenja.³⁸⁻⁴⁰

FIBRILACIJA ATRIJA I SRČANO POPUŠTANJE

Fibrilacija atrijska i srčano popuštanje često su usko povezana stanja koja međusobno utječu na ishod. Studija iz Tanzanije dokazala je da je FA odgovorna za barem 16 % svih slučajeva kliničkoga srčanog popuštanja u bolesnika koji se primaju u bolničke ustanove u tercijarnoj zdravstvenoj skrbi.⁴¹ To je zna-

PREDICTIVE VALUE OF THE CHADS₂ AND CHA₂DS₂Vasc SCORES FOR CARDIOVASCULAR EVENTS IN PATIENTS WITHOUT AF

CHADS₂ and CHA₂DS₂Vasc scores have been validated to predict the risk of stroke in patients with AF.^{34,35} In a study, these scores were used to assess risk of new stroke/transient ischaemic attack (TIA) in the absence of AF in patients with an acute coronary syndrome (ACS).³⁶ Both these scores showed a reasonable association predicted annual risk of stroke/TIA with an absolute annual incidence of 1% with CHADS₂ ≥ 3 and CHA₂DS₂Vasc ≥ 4 . This is in line with the results from another study by *Poci et al*³⁷ that found association of CHADS₂ with mortality and stroke. Others have shown association of these score with mortality after stroke, risk of developing new AF and risk of stroke or death after CABG.³⁸⁻⁴⁰

AF AND HEART FAILURE

AF and heart failure are often 'vicious twins', and each condition can worsen the other. A study in Tanzania showed that AF attributed to at least 16% cases of clinical heart failure presenting to tertiary-care hospital.⁴¹ This is an interesting finding if compared with the EPOCH (Epidemiology, Practice, Outcomes, and Costs of Heart Failure) study conducted in the USA in 2004 that compared epidemiological characteristics of hospitalised patients with heart failure and association of various comorbidities with different ethnicities, which showed AF was prevalent in 19.7% of African-Americans with heart failure as compared with 38.3% in Caucasian patients with heart failure.⁴² The report illustrates the global impact of AF and heart failure.

AF AS A PREDICTOR OF INCREASED MORTALITY IN LOW-GRADIENT AORTIC STENOSIS

AF was found as independent predictor of mortality (HR 1.74) in patients with aortic stenosis (AS) in a large single centre observational study of severe AS treated with medical therapy, surgical aortic valve replacement or transcatheter aortic valve implantation.⁴³ In general, the group receiving medical treatment had the worst prognosis with all-cause mortality of 81% at 3.9 years of follow-up. A study showed AF as a determinant of low-flow state in severe AS (OR 4.17).⁴⁴ In another study, patients with severe low-gradient AS, AF was also associated with a poor prognosis and increased mortality.⁴⁵ These observations highlight the importance to diagnose AF in patients with AS.

OVERALL AF PREVALENCE IN HOSPITALISED PATIENTS

An interesting cross-sectional survey in Belgium on a single day in a tertiary-care hospital identified total prevalence of AF at 16.8%.⁴⁶ The presence of AF was associated with old age, hypertension and valvular heart disease. Interestingly, only 51% were appropriately treated with oral anticoagulation.

PROGNOSIS OF SILENT AF AFTER MYOCARDIAL INFARCTION

An observational study by *Stamboul et al* shows worse 1 year prognosis with increased hospital admissions and worsen-

čajan rezultat, posebice u usporedbi s EPOCH (*Epidemiology, Practice, Outcomes, and Costs of Heart Failure*) studijom provedenom u Sjedinjenim Američkim Državama u 2004. u kojoj su se u hospitaliziranih pacijenta ispitivali razni epidemiološki čimbenici u korelaciji sa srčanim popuštanjem te povezanost raznih komorbiditeta s određenim etničkim skupinama. Studija je dokazala da je zastupljenost FA sa srčanim popuštanjem u Afroamerikanaca 19,7 %, u usporedbi s 38,3 % u bijelaca. Ovo jasno pokazuje globalni utjecaj FA-a i zatajivanja srca.⁴²

FIBRILACIJA ATRIJA KAO PREDIKTOR POVIŠENE SMRTNOSTI KOD TEŠKE AORTNE STENOZE S NISKIM GRADIJENTOM

Pojava FA nezavisni je prediktor smrtnosti (HR 1,74) u pacijenata s aortnom stenozom (AS) prema rezultatima velike opservacijske studiji provedene u jednom centru u kojemu se teška aortna stenozna liječi medikamentno, kirurškom zamjenom aortnog zalistka ili transkateterskom ugradnjom aortne valvule.⁴³ Kod bolesnika koji su bili liječeni farmakološki registrirana je najlošija prognoza s ukupnom smrtnošću od 81% tijekom praćenja od 3,9 godina. Studija je pokazala da je prisutnost FA-a kod teške AS s niskim gradijentom odlučujuća (OR 4,17).⁴⁴ U daljnjim studijama, u populacije pacijenata s teškom AS s niskim gradijentom FA je također bila povezana s lošom prognozom i povišenom smrtnošću.⁴⁵ Ovi podatci ističu važnost dijagnosticiranja FA-a u pacijenata s AS-om.

UKUPNA ZASTUPLJENOST FIBRILACIJE ATRIJA U BOLNIČKI LIJEČENIH PACIJENATA

Rezultati istraživanja provedenog tijekom jednog dana u belgijskoj bolnici koja je u terciarnoj zdravstvenoj zaštiti utvrdili su ukupnu zastupljenost FA-a0 od 16,8%.⁴⁶ Prisutnost FA-a bila je povezano sa starijom životnom dobi, arterijskom hipertenzijom i valvularnom bolesti srca. Zanimljivo je da je samo 51 % pacijenata s FA bilo adekvatno liječeno oralnim antikoagulansima.

PROGNOZA ASIMPTOMATSKE FIBRILACIJE ATRIJA NAKON INFARKTA MIOKARDA

Opservacijska studija koju su proveli *Stamboul i sur.* dokazala je da je u bolnički liječenih pacijenata zbog akutnog infarkta miokarda (AIM) asimptomatska FA unutar 2 dana od prijma u bolnicu znak za lošiju jednogodišnju prognozu s povećanom stopom bolničkog liječenja i pogoršanja zatajivanja srca.⁴⁷ Već je prije iznesena hipoteza da je asimptomatska FA triput češća od simptomatske FA nakon AIM-a.⁴⁸ Zbog toga je važno redovito kontinuirano praćenje elektrokardiograma u svih pacijenata s AIM-om kako bi se otkrila FA.

Probir na asimptomatsku fibrilaciju atrijske

Rana dijagnoza FA bitna je radi započinjanja terapije prije nastupa prvih komplikacija.⁴⁹ U jednome su preglednom radu izložene najnovije tehnike probira na FA.⁵⁰ Kao potencijalno prikladna pomagala za rano otkrivanje FA spominju se monitori elektrokardiograma koje kontrolira sam pacijent ili senzori u pametnim telefonima.⁵¹⁻⁵⁴ U određenih se pacijenata može ugradbenim srčanim monitorom postići viša učestalost detekcije FA-a.⁵⁵ Potreba za programima probira za FA i njihov

ing heart failure for patients found to have silent AF within 2 days of admission with acute myocardial infarction (MI).⁴⁷ It was previously suggested that silent AF was three times more common than symptomatic AF after acute MI.⁴⁸ This highlights importance of continuous ECG monitoring for all patients with MI to detect AF.

Screening for silent AF

Early diagnosis of AF is highly desirable to initiate therapy prior to the first complication.⁴⁹ A review article sheds light on emerging techniques to screen for AF.⁵⁰ Patient-operated ECG monitors or smartphone sensors may be suitable tools to screen for AF.⁵¹⁻⁵⁴ In selected patients, long-term screening with implantable loop recorder can generate more AF detection.⁵⁵ The need for AF-screening programmes, their optimal design and the best use of therapy (mainly oral anticoagulation) are not fully understood. Ongoing studies evaluating initiation of anticoagulation in patients with atrial high-rate episodes (eg, ARTESiA or NOAH-AFNET 6) and community screening programmes such as STROKESTOP^{56,57} will provide further information in future.

Imaging in AF

PROGNOSTIC FACTORS BASED ON IMAGING PARAMETERS

A review article highlights several adverse prognostic features in imaging for AF.⁵⁸ In two-dimensional conventional echocardiography, LA dilatation and left ventricular systolic function was shown to be associated with increased risk of stroke, heart failure and all-cause mortality. Mitral stenosis and hypertrophic cardiomyopathy (HCM) strongly also increases the risk of stroke in AF. In trans-oesophageal echocardiography (TOE), spontaneous echo contrast, LA thrombus and complex aortic valve (AV) plaque predict increased risk of systemic thromboembolism and stroke. In cardiac MRI (CMRI), favourable parameters were associated with decreased risk of stroke (OR 0.2). Moreover, LA conduit function as measured by CMRI was an important measure of success after catheter ablation (**Figure 4**).

BRAIN MRI TO TAILOR ANTICOAGULATION THERAPY

Another review article looked into the value of brain MRI imaging to tailor anticoagulation therapy.⁵⁹ It was found that silent brain infarction is commonly seen in patients with AF.^{60,61} This is found to be dependent on the age of patient and on the type of AF. Presence of cerebral microbleeds (CMB), which are frequently found in patients with AF without prior stroke, should be taken as a risk for intracranial bleeding on anticoagulation. However, large studies are needed to confirm this observation. Number and location of CMB is affected by CHADS₂ and CHA₂DS₂Vasc scores. This is mostly due to effect of vascular risk factors (**Figure 5**).⁶²

optimalni ustroj te najbolji način korištenja lijekovima (prije svega oralnim antikoagulansima) nisu još sasvim razjašnjeni. Trenutačno su u tijeku studije kojima je svrha procijeniti uvođenje antikoagulacijskih lijekova u pacijenata s epizodama atrijske tahikardije (npr. studije ARTESiA ili NOAH-AFNET 6), a trijažni programi u zajednici kao što je STROKE-STOP^{56,57} pružit će nam nove podatke u budućnosti.

Metode oslikavanja u fibrilaciji atrijske

PROGNOSTIČKI ČIMBENICI ZASNOVANI NA SLIKOVNIM VARIJABLAMA

Jedan je pregledni rad naglasio nekoliko negativnih prognostičkih čimbenika za FA u slikovnim prikazima.⁵⁸ U dvodimenzionalnoj konvencionalnoj ehokardiografiji dokazano je da su dilatacija lijevog atrijske (LA) i sistolička funkcija lijeve klijetke povezane s povećanim rizikom od razvoja moždanog udara, zatajivanja srca i ukupne smrtnosti. Mitralna stenoza i hipertrofijska kardiomiopatija također snažno povećavaju rizik od moždanog udara u FA. U transezofagealnoj ehokardiografiji prisutnost spontanog eho-kontrasta, tromba u LA i značajnog plaka na aortnom zalistku predviđaju povećani rizik od sustavnog tromboembolizma i moždanog udara. Pri magnetnoj rezonanciji (MRI) srca pozitivni su parametri bili povezani sa smanjenim rizikom od moždanog udara (OR 0,2). Nadasve, funkcija LA određivana magnetnom rezonancijom srca bila je važna mjera procjene uspješnosti nakon kateterske ablacije (slika 4).

UPORABA MAGNETNE REZONANCIJE MOZGA ZA ODREĐIVANJE PRIMJENE ANTIKOAGULACIJSKE TERAPIJE

Jedan pregledni rad istražio je korisnost MRI-a mozga pri određivanju antikoagulacijske terapije.⁵⁹ Utvrđeno je da su asimptomatski moždani infarkti često prisutni u pacijenata s FA,^{60,61} i da ta prisutnost ovisi o životnoj dobi pacijenata i tipu FA-a. Prisutnost moždanih mikrokrvarenja, koja su česta u pacijenata s FA koji nisu doživjeli prethodni moždani udar, treba uzeti kao čimbenik rizika za intrakranijsko krvarenje pri primjeni antikoagulacijskih lijekova, iako su potrebne veće studije da bi se ovo opažanje potvrdilo. Vrijednosti na

Body Surface Potential Mapping and ECG imaging in AF

Use of ECG imaging, a novel fibrillation imaging modality using surface ECG combined with cardiac CT/MRI for the atrial anatomy to assess complexity of AF, was also highlighted.⁶³ More recently, Body Surface Potential Mapping has been shown to identify the high-frequency sources in the atria without an imaging modality that were previously measured by invasive methods.⁶⁴ This can lead to better patient selection before the actual ablation procedure based on the prediction of response to AF ablation therapy.

Anticoagulation for stroke prevention

WHICH ANTITHROMBOTIC THERAPY: NOACS, VITAMIN K ANTAGONIST, COMBINATION THERAPY

A large network meta-analysis of 20 studies combining more than 78 000 patients demonstrated that the new oral anticoagulants performed better in reducing the risk of stroke or venous embolism.⁶⁵ Another meta-analysis with more than 100 000 patients showed 47% and 64% odds risk reduction of fatal bleeding with NOAC compared with vitamin K antagonist (VKA) therapy and low-molecular weight heparin (LMWH).⁶⁶

It is well established that combined antiplatelet therapy and anticoagulation increases the risk of bleeding and that such 'triple therapy' should be confined to short periods of time in selected patients with ACS and/or recent PCI.^{67,68} An analysis of large European data set identified a common mistake in antithrombotic therapy in patients with AF, that is, the continuation of aspirin therapy in patients with stable vascular disease.⁶⁹ Far more than half of the patients subjected to combination therapy with aspirin and oral anticoagulation had no indication for combination therapy, putting them at unnecessary risk for bleeding.

The TIARA trial in 238 patients, comparing aspirin and anticoagulation in a cohort of patients with AF with moderate stroke risk and 'favourable' imaging characteristics on TOE, suggested that some patients may fare well without antico-

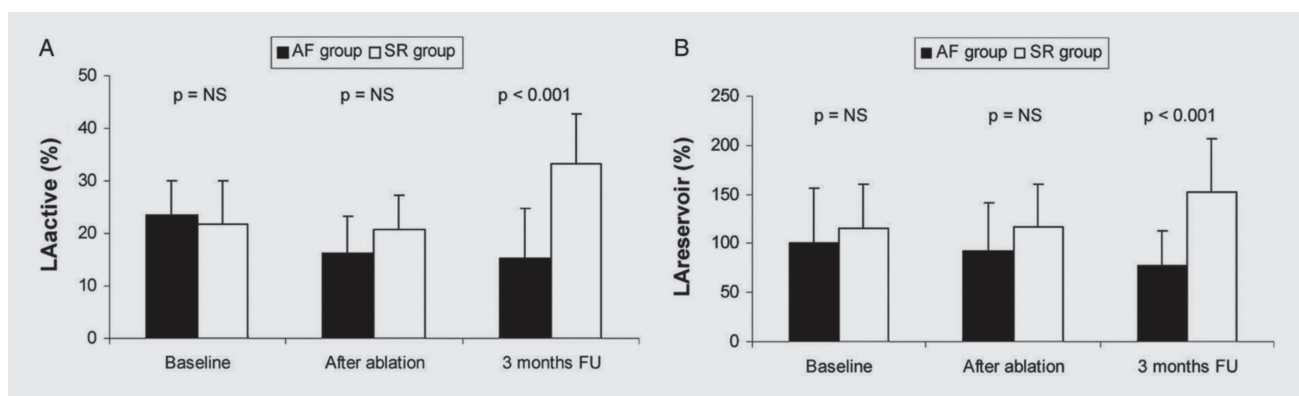


FIGURE 4. Changes in LA function after catheter ablation. SR group shows an improvement in LA reservoir function. AF, atrial fibrillation; LA, left atrial; NS, not significant.

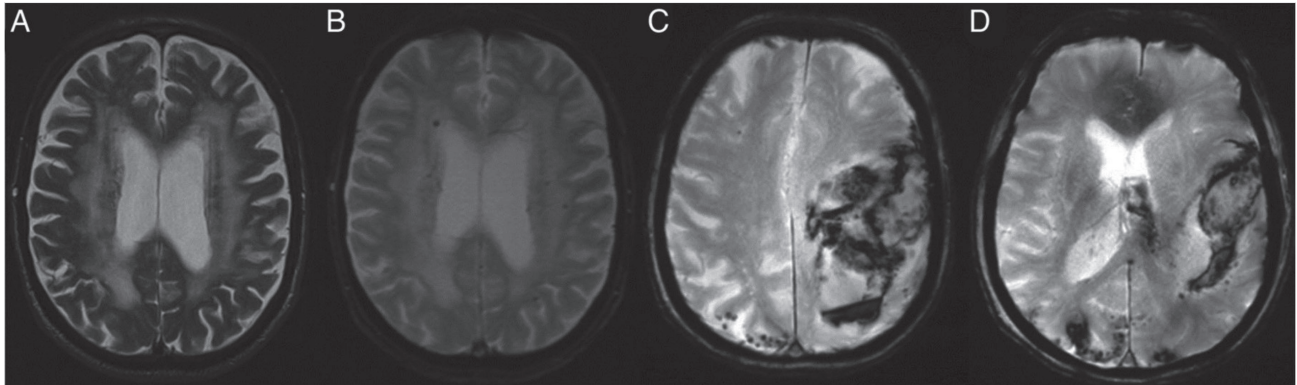


FIGURE 5. Patients with atrial fibrillation deemed unsuitable for oral anticoagulation T2 (A) and T2* (B) image at 1.5 T demonstrating confluent white matter hyperintensities and cerebral microbleeds in a patient with atrial fibrillation with recent transient ischaemic attack T2* images (C/D) at 3.0 T demonstrating an acute lobar haemorrhage and multiple cerebral microbleeds in a patient with atrial fibrillation with suspected cerebral amyloid angiopathy.⁵⁹

bodovnim sustavima CHADS₂ i CHA₂DS₂Vasc utječu na broj i količinu cerebralnih mikrokrvarenja, prije svega zbog učinka vaskularnih čimbenika rizika (slika 5).⁶²

MAPIRANJE POTENCIJALA NA POVRŠINI TIJELA I OSLIKAVANJE ELEKTROKARDIOGRAMA KOD FIBRILACIJE ATRIIJA

Spomenuta je i uporaba slikovnog EKG-a, novog modaliteta oslikavanja atrijske anatomije kod FA primjenom elektrokardiograma istodobno s kardiološkim CT-om ili MRI-jem radi bolje procjene kompleksnosti FA.⁶³ Nedavno je dokazano da mapiranje potencijala na površini tijela otkriva visokofrekventne izvore u atriju bez modaliteta oslikavanja, što se dosad mjerilo invazivnim metodama.⁶⁴ To može dovesti do boljeg selekcioniranja pacijenata prije samog postupka predviđanjem odgovora na liječenje FA ablacijskom terapijom.

Antikoagulantna terapija za prevenciju moždanog udara

KOJE ANTITROMBOTSKO LIJEČENJE ODABRATI: NOVE ORALNE ANTIKOAGULANSE, ANTAGONISTE VITAMINA K ILI KOMBINIRANO LIJEČENJE?

Velika metaanaliza koja je uključila 20 studija s ukupno više od 78 000 pacijenata dokazala je da novi oralni antikoagulansi (NOAC) dovode do znatnijeg smanjenja rizika od moždanog udara ili venskog embolizma.⁶⁵ Druga metaanaliza sa uključene više od 100 000 pacijenata upozorila je na 47 %, odnosno 64 % smanjenja rizika od smrtonosnog krvarenja uz uporabu NOAC-a u usporedbi s antagonistima vitamina K (VKA) i niskomolekulskim heparinom (LMWH).⁶⁶

Jasno je utvrđeno da kombinirana antitrombocitna i antikoagulacijska terapija povećava rizik od krvarenja i da takvu trojnu terapiju treba ograničiti na kratka razdoblja u probirnim pacijenata s akutnim koronarnim sindromom i/ili nedavnom perkutanom koronarnom intervencijom.^{67,68} Analiza velike europske baze podataka otkrila je čestu pogrešku u an-

agulation.⁷⁰ They found that in the absence of LA thrombus on TOE, aspirin was non-inferior to VKA for all-cause mortality, stroke, ACS and major bleeding. Interestingly, TIA was not included as a primary end point, and seven patients suffered from TIA in the aspirin group. This highlights the challenges when considering individualised anticoagulation therapy in patients at low-to-moderate stroke risk. The results of this pilot study need validation by a larger scale trial.

ANTICOAGULATION IN ATRIAL FLUTTER

A review article published in 2015, taking into account 52 published articles, indicated that atrial flutter renders a higher risk of thromboembolic complications.⁷¹ Imaging in atrial flutter also reveals high prevalence of spontaneous echo contrast and thrombus in left atrial appendage (LAA). Within the limitations of the small published data sets, this analysis underpins the current practice to offer anticoagulation to flutter patients.

Ablation for AF

SURGICAL ABLATION

A meta-analysis summarising the available information on surgical ablation for AF has been published.⁷² This extensive and first-of-its-kind meta-analysis suggests that surgical LA ablation is a safe and effective method of maintaining sinus rhythm for more than 1 year in patients with AF and undergoing concomitant cardiac surgery as compared with cardiac surgery alone.

NOACS OR WARFARIN IN CATHETER ABLATION

A meta-analysis of 14 observational data sets compared dabigatran and warfarin for risks of thromboembolic events and major bleeds.⁷³ There was no significant difference found between the two groups for either of the two end points. However, a numerical difference of more thromboembolic events in dabigatran group versus warfarin (0.55% dabigatran vs 0.17% warfarin, RR 1.78, 95% CI 0.66 to 4.80, p=0.26) was seen.

titrombotskom liječenju pacijenata s FA kao što je nastavljeno liječenje acetilsalicilatnom kiselinom (ASK) u pacijenata sa stabilnom vaskularnom bolešću.⁶⁹ Kod više od polovice bolesnika podvrgnutih kombiniranoj terapiji primjenom ASK-a i oralnim antikoagulansima nije bilo indikacije za takvu terapiju, odnosno bili su nepotrebno izloženi riziku od krvarenja.

U ispitivanju TIARA, u kojemu je uspoređivana terapija ASK-om i antikoagulansima u 238 pacijenata sa FA koji su imali umjeren rizik od moždanog udara i „povoljne“ slikovne karakteristike pri oslikavanju transezofagealnom ehokardiografijom, utvrđeno je da pojedinim pacijentima možda i ne treba antikoagulantna terapija.⁷⁰ Ustanovljeno je da u odsutnosti transezofagealnom ehokardiografijom dokazanog tromba u lijevoj atriji, primjena ASK-a nije bila lošija od primjene VKA u prevenciji ukupne smrtnosti, moždanog udara, akutnoga koronarnog sindroma i ozbiljnog krvarenja. Zanimljivo je da TIA nije bila uvrštena kao primarni ishod studije, pri čemu je sedam pacijenata u skupini liječenoj ASK-om doživjelo TIA-u. To upućuje na izazov pri individualiziranom pristupu antikoagulacijskoj terapiji u pacijenata s niskim do srednjim rizikom od moždanog udara. Rezultate ovog pilot-istraživanja treba potvrditi u većem kliničkom ispitivanju.

ANTIKOAGULANTNA TERAPIJA KOD UNDULACIJE ATRIJA

U preglednom članku iz 2015. godine, temeljenom na 52 prije objavljena članka, zaključeno je da undulacija atrija donosi povišeni rizik od tromboembolijskih komplikacija.⁷¹ Također, indikator povišenog rizika jest i nalaz spontanog ehokontrasta i tromba u aurikuli lijevog atrija u pacijenata s undulacijom atrija. Unutar ograničenja koja proizlaze iz relativno male količine dokaza, ova analiza potkrepljuje trenutačnu praksu primjene antikoagulantne terapije u bolesnika s undulacijom atrija.

Ablacija fibrilacije atrija

KIRURŠKA ABLACIJA

Objavljena je prva metaanaliza širokog raspona koja sažima sve raspoložive podatke o kirurškoj ablaciji kod FA.⁷² Ona je pokazala da je kirurška ablacija lijevog atrija sigurna i uspješna metoda održavanja sinusnog ritma u razdoblju duljem od godine dana u pacijenata koji imaju FA te su istodobno podvrgnuti operaciji srca i kirurškoj ablaciji u usporedbi sa samom operacijom srca.

NOVI ORALNI ANTIKOAGULANSI I VARFARIN KOD KATETERSKE ABLACIJE

Metaanaliza koja je obuhvatila 14 opservacijskih studija uspoređivala je rizik za razvoj tromboembolije i ozbiljnog krvarenja kod primjene dabigatrana i varfarina.⁷³ Nije dokazana statistički značajna razlika između primjene obaju lijekova ni za primarne ni za sekundarne ciljeve istraživanja. Ipak, postojala je brojčana razlika od nešto više tromboembolijskih događanja u skupini koja se koristila dabigatranom (0,55 % dabigatran prema 0,17 varfarin, RR 1,78, 95% CI 0,66 do 4,80, p = 0,26).

Druga metaanaliza objavljenih opservacijskih studija također je utvrdila trend nepovoljnih neuroloških ishoda s dabigatranom u usporedbi s varfarinom, ali bez statističke zna-

čajnosti. Druga metaanaliza objavljenih opservacijskih studija također je utvrdila trend nepovoljnih neuroloških ishoda s dabigatranom u usporedbi s varfarinom, ali bez statističke zna-

CHANGE IN RENAL FUNCTION ASSOCIATED WITH ARRHYTHMIA RECURRENCE

A German study with a cohort of 783 subjects found an associated with AF recurrence and worsening renal function (GFR).⁷⁶ It was found that patients with recurrence had worse GFR on baseline and on follow-up. The higher CHADS₂ and CHA₂DS₂-Vasc scores were associated with worse renal functions. Finally, those patients who had decline in their GFR had more AF recurrences. This effect was independent of the type of OAC used. AF is known to decrease renal function.⁷⁷ This may be possibly due to embolic phenomenon or haemodynamic mechanisms related to AF. Ablation and restoration of sinus rhythm generally improves renal function.⁷⁸ However, deterioration of renal function may contribute to recurrent AF. Further studies are clearly needed to validate this novel observation (Figure 6).

Peri-procedural imaging in catheter ablation

An observational study found an association between peri-procedural cardiac imaging such as TOE, intracardiac echocardiography (ICE), cardiac CT and MRI, and better outcomes in patients undergoing catheter ablation for AF.⁷⁹ They found that use of preprocedural cardiac CT/MR was associated with a lower risk of TIA/stroke at 6 months (0.4% vs 0.9%, adjusted HR 0.46). Use of ICE was found to be associated with higher risk of bleeding (1.1% vs 0.7%, adjusted HR 1.76), but also with a lower incidence of repeat ablation (5.7% vs 8.5%, adjusted HR 0.68). Interestingly, TOE was not found to affect procedural outcomes. The usefulness of cardiac CT and MRI in identifying LA thrombus in patients undergoing ablation has been found in other studies^{80,81} on top of their benefit in assessing cardiac anatomy and pulmonary vein size and location⁸²⁻⁸⁴ and chances of successful outcome (Figure 7).⁸⁵

AF-related inappropriate shocks in patients with ICD

It has been known that prolonged ECG monitoring with pacemakers and CRT-D have high detection rates of atrial high-rate episodes,^{86,87} especially those with home monitoring that decreases the time to detect AHRE.⁸⁸ Most, but not all of these episodes reflect paroxysmal, often undiagnosed (silent) AF. In a study of 1404 patients, it was found that AF lasting for more than 10 min is detected in a quarter of the patients who received CRT-D.⁸⁹ Roughly, three-quarters of all inappropriate arrhythmia detections were due to AF, with 60 patients (4% of the total) receiving inappropriate shocks due to AF (2.69 patients/100 patient-years). Reprogramming of the shock criteria

čajnosti.⁷⁴ U trećoj metaanalizi nije nađena značajna razlika između dabigatrana i varfarina.⁷⁵ Potrebno je provesti kontrolirana ispitivanja kontinuiranog antikoagulacijskog liječenja u pacijenata s kateterskom ablacijom FA.

PROMJENE U BUBREŽNOJ FUNKCIJI POVEZANE S PONOVNOM POJAVOM ARITMIJE

U njemačkoj kohortnoj studiji s uključena 783 sudionika pronađena je povezanost recidivirajućih epizoda FA-a s pogoršanjem bubrežne funkcije (vrijedost glomerularne filtracije; GFR).⁷⁶ Otkriveno je da pacijenti s recidivirajućim epizodama FA-a imaju lošiju početnu GFR te tijekom daljnjeg praćenja. Viši zbroj prema CHADS₂ i CHA₂DS₂-Vasc bodovnim sustavima također je povezan s lošijom bubrežnom funkcijom. Konačno, pacijenti s pogoršanjem GFR također su imali češće recidivirajuće epizode FA. Ovaj je rezultat bio neovisan o vrsti oralne antikoagulantne terapije kakva je primijenjena. Poznato je da FA smanjuje funkciju bubrega,⁷⁷ što može biti posljedica embolijskih fenomena ili hemodinamskih mehanizama povezanih s FA. Ablacija i uspostava sinusnog ritma najčešće poboljšavaju funkciju bubrega,⁷⁸ no moguće je da pogoršanje bubrežne funkcije dovodi do ponovne pojave recidiva FA. Potrebna su dodatna istraživanja (slika 6).

Periproceduralna uporaba oslikavanja kod kateterske ablacije

Pacijenti podvrgnuti kateterskoj ablaciji FA u kojih su periproceduralno primjenjivane slikovne metode (transezofagealna ehokardiografija, intrakardijalna ehokardiografija – ICE te kardiološki CT i MRI) imali su bolji ishod, prema nalazima jedne opservacijske studije.⁷⁹ Primjena oslikavanja kardiološkim CT-om/MR-om prije samog postupka povezana je sa smanjenim rizikom od TIA / moždanog udara tijekom šestomjesečnog razdoblja (0,4 % prema 0,9%, prilagođeni HR 0,46). Uporaba oslikavanja s pomoću ICE-a bila je povezana s većim rizikom od krvarenja (1,1 % prema 0,7%, prilagođeni HR 1,76), ali i nižom stopom ponovnih ablacijskih postupaka (5,7 % prema 8,5 %, prilagođeni HR 0,68). Zanimljivo je da uporaba oslikavanja transezofagealnom ehokardiografijom nije utjecala na sam ishod ablacije. Korisnost kardiološkog CT-a i MRI-a u otkrivanju tromba u LA u pacijenata podvrgnutih ablaciji utvrđena je u drugim studijama,^{80,81} povrh njihova pozitivnog učinka na procjenu anatomije srca i veličine i pozicije plućnih vena⁸²⁻⁸⁴ te pozitivnog učinka na uspješan ishod postupka (slika 7).⁸⁵

Neprikladni udari povezani s fibrilacijom atriya u pacijenata s implantabilnim kardioverterskim defibrilatorom

Poznato je da dugotrajno praćenje elektrokardiograma na elektrostimulatoru i uređajima za srčanu resinkronizacijsku terapiju (CRT-D) ima visoku učestalost otkrivanja atrijskih epizoda visoke frekvencije (AHRE),^{86,87} posebice u onih uređaja koji omogućuju praćenje od kuće, što smanjuje vrijeme do ot-

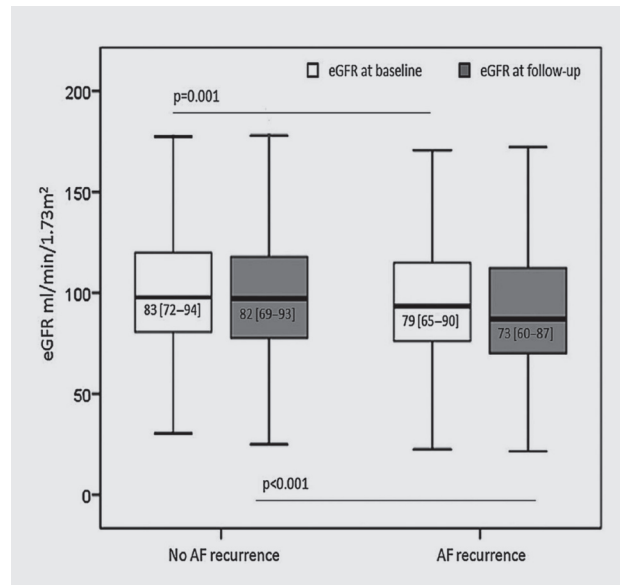


FIGURE 6. Estimated GFR in patients with and without recurrences at baseline and follow-up.⁷⁶ AF, atrial fibrillation.

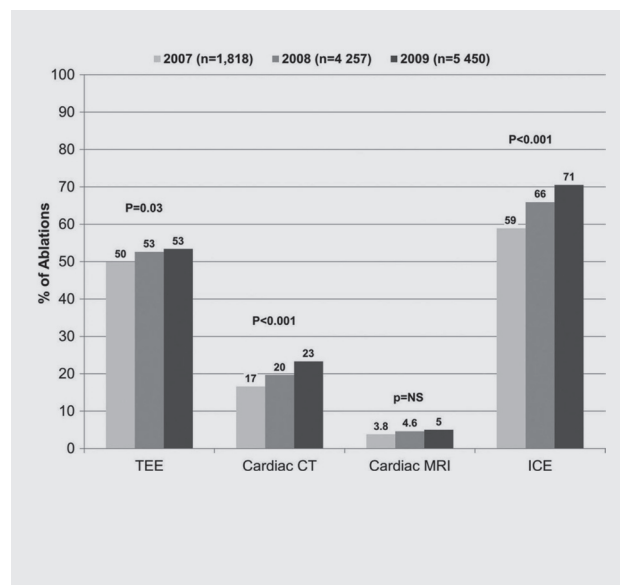


FIGURE 7. Temporal trends of imaging usage before (CT, MRI, TOE) and during (ICE) ablation.⁷⁹ ICE, intracardiac echocardiography.

could have avoided many of these inappropriate shocks. Another French case report also explained the use of home monitoring to prevent in appropriate AF-related shocks (Figure 8).⁹⁰

In summary, AF remains one of the major topics of research published in *Heart*. We learned a lot, but there is a lot more to find out and study to improve outcomes in patients with AF in future.

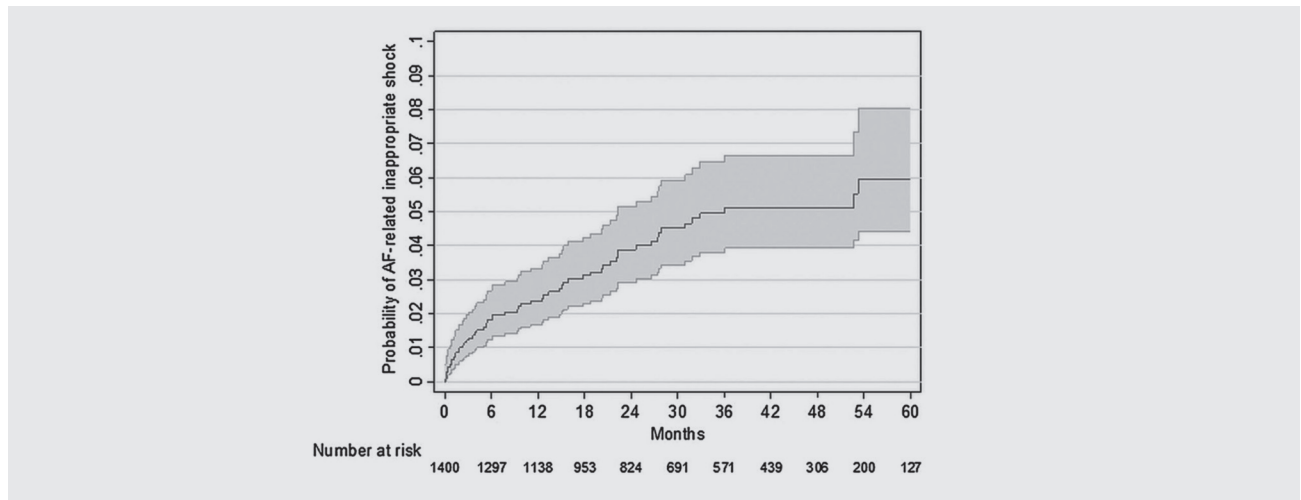


FIGURE 8. Kaplan–Meier estimation of probability of atrial fibrillation-related (AF-related) inappropriate shocks.⁶⁹

krivanja AHRE-a.⁸⁸ Većina tih epizoda, no ne sve, posljedica su paroksizmalne, često nedijagnosticirane (asimptomatske) FA.

U studiji s uključena 1404 pacijenta otkriveno je da su FA u trajanju od više od 10 minuta prisutne u četvrtine pacijenata u kojih je implantiran CRT-D.⁸⁹ Kod gotovo tri četvrtine svih otkrivenih neprikladnih aritmija riječ je bila o FA, pri čemu je 60 pacijenata (4 % ukupnog broja) dobivalo neprikladne udare zbog FA (2,69 pacijenata/100 pacijent-godina). Reprogramiranjem kriterija za isporuku udara mogu se izbjeći mnoge od navedenih epizoda. U jednom francuskom prikazu slučaja opisana je uporaba kućnog monitoringa radi sprječavanja neprikladnih udara zbog FA (slika 8).⁹⁰

Zaključno, FA je i dalje jedan od vodećih tema istraživanja koja se objavljuju u časopisu *Heart*. Naučili smo mnogo, no još mnogo toga treba otkriti i istražiti kako bi se u budućnosti poboljšali klinički ishodi pacijenata s FA-om.

CONTRIBUTORS Both authors prepared and reviewed the text and searched for relevant papers in Heart 2014 and 2015.

FUNDING The preparation of this article was partially supported by funds from Charité Berlin (MonDAFIS), BHF (FS/13/32/30324), and Leducq Foundation.

COMPETING INTERESTS None declared.

PROVENANCE AND PEER REVIEW Commissioned; internally peer reviewed.

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