

26TH ANNUAL MEETING OF THE

Alpe Adria Association of Cardiology

18–19 May 2018, Ljubljana, Slovenia

**SCIENTIFIC
PROGRAMME
AND BOOK OF PAPERS**



Slovenian
Society of Cardiology

MEMBER OF THE ESC



26th ANNUAL MEETING OF THE ALPE ADRIA ASSOCIATION OF CARDIOLOGY / 26. LETNO SREČANJE ZDRUŽENJA KARDIOLOGOV ALPE – JADRAN

PLACE & DATES / KRAJ IN DATUMI

Ljubljana, Slovenia, May 18 – 19, 2018 /
Ljubljana, Slovenija, 18. – 19. Maja 2018

VENUE / LOKACIJA

Medical Education Centre - Domus Medica, Blue Hall /
Medicinsko izobraževalni center - Domus Medica, Modra dvorana

ORGANIZER / ORGANIZATOR

Združenje kardiologov Slovenije – Kardiološka akademija /
Slovenian Society of Cardiology – Cardiology Academy

ORGANIZING COMMITTEE / ORGANIZACIJSKI ODBOR

Zlatko Fras, Borut Jug, Dragan Kovačič, Luka Lipar, Andreja Sinkovič, Saša Radelj

ALPE-ADRIA ASSOCIATION OF CARDIOLOGY – International Scientific Advisory Board / ZDRUŽENJE KARDIOLOGOV ALPE – JADRAN – Mednarodni strokovni svetovadni odbor

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Slovakia / Slovaška:	Robert HATALA, Peter HLIVAK



SCIENTIFIC PROGRAMME

STROKOVNI PROGRAM

Friday, May 18, 2018

Petek, 18. maj 2018

14.00 – 14.30 **Opening – Alpe-Adria Association of Cardiology Meeting /**
Otvoritev srečanja Alpe-Adria Association of Cardiology /

Welcome Addresses / Pozdravi dobrodošlice

14.30 – 16.00 **Session 1 / Sklop 1**

Joint Symposium – ESC – SSC (European Society of Cardiology – Slovenian Society of Cardiology) / Skupni simpozij – ESC – ZKS (Evropsko kardiološko združenje – Združenje kardiologov Slovenije)

Chairmen / Predsedujoča:

Bela Merkely (Budapest, Hungary), Zlatko Fras (Ljubljana, Slovenija)

Treatment of myocardial infarction: recent lessons and remaining gaps /

Zdravljenje srčnega infarkta: nedavne lekcije in obstoječe vrzeli

Franz Weidinger (Vienna, Austria)

Contemporary interventional treatment of stable coronary artery disease /

Sodobno intervencijsko zdravljenje stabilne koronarne bolezni

Matjaž Bunc (Ljubljana, Slovenija)

Cardiac resynchronization therapy: state of the art / Resinhronizacijsko zdravljenje: pregledno predavanje
Bela Merkely (Budapest, Hungary)

Advanced heart failure treatment with artificial heart device: new insights / Zdravljenje napredovalega srčnega popuščanja z umetnim srcem: najnovejši vpogledi
Bojan Vrtovec (Ljubljana, Slovenija)

16.00 – 16.30

Break / Odmor

16.30 – 17.45 **Session 2 / Sklop 2**

Preventive cardiology – some of the core issues and future opportunities / Zdravljenje dislipidemij – nekatera ključna dejstva in priložnosti za prihodnost

Chairmen / Predsedujoča:
Borut Jug, Matija Cevc (Ljubljana, Slovenia)

Current state of secondary cardiovascular prevention in Europe: EUROASPIRE V results / Trenutno stanje sekundarne srčno-žilne preventive v Evropi: predstavitev rezultatov EUROASPIRE V
Kornelia Kotseva, Zlatko Fras (London, United Kingdom; Ljubljana, Slovenia)

10 facts to consider when treating dyslipidaemias / 10 dejstev, ki jih je potrebno upoštevati pri zdravljenju dislipidemij
Dimitri Mikhailidis (London, United Kingdom)

Present and future of treatment with modern lipid lowering agents / Sedanjost in prihodnost zdravljenja s sodobnimi zdravili za zniževanje krvnih maščob
Philippe Gabriel Steg (Paris, France)



17.45 – 19.00 **Session 3 / Sklop 3**

How to prepare and write good scientific paper and/or abstract ? / Kako pripraviti in napisati dober znanstveni članek in/ali povzetek?

Chairpersons / Predsedujoča:

Robert Hatala (Bratislava, Slovakia), Franz Weidinger (Vienna, Austria)

17.45 – 18.30 **Plenary Lecture / Plenarno predavanje**

How to prepare and write good scientific paper / Kako pripraviti in napisati dober znanstveni članek

Dimitri Mikhailidis (London, United Kingdom)

18.30 – 19.00 **Panel Discussion / Razprava strokovnjakov**

How to prepare and write good scientific abstract / Kako pripraviti in napisati dober znanstveni povzetek

Panelists / Razpravljalci:

Robert Hatala (Bratislava, Slovakia)

Mitja Lainščak (Murska Sobota, Slovenia)

Bela Merkely (Budapest, Hungary)

Dimitri Mikhailidis (London, United Kingdom)

Franz Weidinger (Vienna, Austria)

19.00 – 20.00 **Session 4 / Sklop 4**

Satellite Symposium (sponsored by Sanofi) / Satelitski simpozij (pokrovitelj Sanofi)

Contemporary lipid management in high cardiovascular risk patients - from concept to clinical practice / Sodobno uravnavanje krvnih maščob pri srčno-žilno zelo ogroženih bolnikih – od koncepta do klinične prakse

Chairmen / Predsedujol:

Zlatko Fras (Ljubljana, Slovenia)

How will recent evidence in lipid management change the landscape of cardiovascular prevention? / Kako bodo nedavni znanstveni izsledki spremenili panoramo srčno-žilne preventive ?
Željko Reiner (Zagreb, Croatia)

From evidence to clinical practice – position of PCSK9 inhibitors today and tomorrow / Od znanstvenih dokazov do klinične prakse – vloga zaviralcev PCSK9 danes in jutri
Aleš Blinc (Ljubljana, Slovenia)

Panel discussion / Razprava skupine strokovnjakov

20.00 **Social Event for all participants /**
Družabni dogodek za vse udeležence

Saturday, May 19, 2018
Sobota, 19.maj 2018

08.30 – 10.00 **Session 5 / Sklop 5**
Cardiologists of tomorrow /
Kardiologi jutrišnjega dne
Free communications / Proste teme

Chairmen/ Predsedujoča:
Bela Merkely (Budapest, Hungary), Luka Lipar (Ljubljana, Slovenija)

Association between the heterogeneity of repolarization and arrhythmias in patients with CRT / Povezava med heterogenostjo repolarizacije in pojavnostjo motenj ritma pri bolnikih s CRT
Marta Cvijić, Bor Antolič, Luka Klemen, Igor Zupan (Ljubljana, Slovenia)

Cardioneuroablation in ictal asystole – new proposed treatment modality / Kardioneuroablacija - nova oblika zdravljenja iktične asistolije
Bor Antolič, Veronika Rutar Gorišek, David Žižek (Ljubljana, Slovenia)



A classical twin study of coronary plaque composition and plaque burden
**Zsófia Drobní¹, Marton Kolossvary¹, Adam L. Jermendy¹, David L. Tarnoki¹,
Balint Szilveszter¹, Adam D. Tarnoki¹, Julia Karady¹, Gyorgy Jermendy¹,
Szilard Voros², Bela Merkely¹, Pal Maurovich-Horvat¹** (Budapest, Hungary;
²Richmond, USA)

**Differentiation of hypertrophic cardiomyopathy and athlete's heart using
cardiac magnetic resonance imaging**
**Csilla Czibalmos, Ibolya Csécs, Attila Tóth, Zsófia Dohy, Liliána Erzsébet
Szabó, Ferenc Imre Suhai, Vencel Juhász, Orsolya Kiss, Béla Merkely,
Hajnalka Vágó** (Budapest, Hungary)

**Left ventricular reverse remodeling after transcatheter aortic valve
replacement as assessed by cardiac CT angiography**
**Bálint Szilveszter, Daniel Oren, Márton Kolossváry, Borbála Vattay, Júlia
Karády, Andrea Bartykowska, Ferenc Suhai, Ádám L. Jermendy, Alexis
Panajotu, Anikó I. Nagy, Apor Astrid, Levente Molnár, Béla Merkely, Pál
Maurovich-Horvat** (Budapest, Hungary)

**Exercise training in adults after tetralogy of Fallot repair / Telesni trening
pri odralih po popravi tetralogije Fallot**
Marko Novakovič (Ljubljana, Slovenia)

10.00 – 11.15 **Session 6 / Sklop 6**

Cardiovascular imaging / Slikovna diagnostika

Chairpersons / Predsedujoča:
Paolo Fioretti (Udine, Italy), Nataša Černič Šuligoj (Izola, Slovenia)

**CT imaging of vulnerable plaque and vulnerable patient / Slikanje ranljive
aterosklerotične lehe in ranljivega bolnika z računalniško tomografijo**
Pal Maurovich – Horvat (Budapest, Hungary)

**Multimodality imaging in valvular heart disease / Večpredstavna slikovna
diagnostika pri boleznih srčnih zaklopk**
Tomaž Podlesnikar (Leiden, The Netherlands; Maribor, Slovenija)

**Reverse remodelling in dilated cardiomyopathy / Reverzno remodeliranje pri
dilatativni kardiomiopatiji**
Marco Merlo (Trieste, Italy)

11.15 – 11.45

Break / Odmor

11.45 – 13.30 **Session 7 / Sklop 7**

Advances in cardiology / Napredek v kardiologiji

Chairmen / Predsedujoča:

Kalman Toth (Pecs, Hungary), Robert Hatala (Bratislava, Slovakia)

Double vs. triple antithrombotic therapy in patients with atrial fibrillation undergoing PCI and stenting / Protitrombotično zdravljenje z dvema oziroma tremi zdravili - bolniki z atrijsko fibrilacijo in PCI z vstavitvijo žilne opornice
Kurt Huber (Vienna, Austria)

Role of remote monitoring in pacemaker population / Vloga spremljanja na daljavo pri bolnikih s srčnimi spodbujevalniki
Alessandro Proclemer (Udine, Italy)

ECG screening in the prevention of sudden death in adolescents and young adults – what to focus on? / EKG presejanje z namenom preprečevanja nenadne srčne smrti pri mladostnikih in mladih odraslih – na kaj je treba biti pozoren ?
Viera Illíková (Bratislava, Slovakia)

Independent predictors of in-hospital mortality in high risk patients with STEMI / Neodvisni napovedniki bolnišnične umrljivosti bolnikov z miokardnim infarktom in dvigom veznice ST (STEMI) z velikim tveganjem za zaplete
Andreja Sinkovič (Maribor, Slovenija)

13.30 – 14.30

Lunch Break



14.30 – 16.00 **Session 8 / Sklop 8**

Hot Topics / Aktualne teme

Chairpersons / Predsedujoča:

Dubravko Petrač (Zagreb, Croatia), Andreja Sinkovič (Maribor, Slovenia)

Subclinical atrial fibrillation – how to cope with the new epidemics? /

Subklinična atrijska fibrilacija – kako se zoperstaviti novi epidemiji ?

Robert Hatala (Bratislava, Slovakia)

Interference of atrial fibrillation with heart failure therapy / Vpliv atrijske fibrilacije na zdravljenje srčnega popuščanja

Dubravko Petrač (Zagreb, Croatia)

Catheter ablation of ventricular tachycardia – *vanitas vanitatum* or meaningful endeavor? / Kateterska ablacija ob prekatni tahikardiji – *vanitas vanitatum* ali smiseln poseg ?

Peter Hlivak (Bratislava, Slovakia)

On the role of the stethoscope in 21st century / Vloga stetoskopa v 21.stoletju

David Žižek (Ljubljana, Slovenia)

16.00 – 17.00 **Session 9 / Sklop 9**

Discussion Forum: Alpe-Adria Association of Cardiology: past, present and future / Razprava v forumu: Kardiološko združenje Alpe – Jadran – zgodovina, sedanjost in prihodnost

17.00

Closing Remarks / Zaključni poudarki

FREE COMMUNICATIONS / PROSTE TEME

Poster Presentations / Predstavitve na plakatih

- 1. Medical engineering as a patient-specific planning support system in complex cardiac surgical cases - Case series**
Imre J. Barabás, Tivadar Hüttl, Levente Fazekas, Miklós Pólos, László Daróczi, Kálmán Benke, Andrea Kószegi, Péter Kovács, Ádám Koppányi, Roland Tóth, Ferenc Horkay, Zoltán Szabolcs, István Hartyánszky (Budapest, Hungary)
- 2. T-TAS: first experience with a new global platelet function test in patients after PCI**
Péter Óvári, József Faluközy, Gábor Veress, Béla Merkely, Dániel Aradi (Balatonfüred & Budapest, Hungary)
- 3. Fragmented QRS in hypertrophic cardiomyopathy – myocardial scar marker?**
Zsófia Dohy, Czimbalmos Csilla, Csécs Ibolya, Suhai Ferenc Imre, Tóth Attila, Vencel Juhász, Liliána Szabó, Zoltán Pozsonyi, Vereckei András, Merkely Béla, Vágó Hajnalka (Budapest, Hungary)
- 4. Predictors of long-term mortality and reablation in patients undergoing ischaemic or non-ischaemic VT ablation**
Kludia Vivien Nagy, Nándor Szegedi, Edvárd Szabó-Madácsi, Gábor Széplaki, Tamás Tahin, István Osztheimer, Szilvia Herczeg, Szilvia Kugler, Zoltán Salló, Béla Merkely, László Gellér (Budapest, Hungary)
- 5. Pharmacological stimulation of the NO/SGC/cGMP pathway reduces ischemia-reperfusion injury and improves donor organ function in a rat model of heterotopic heart transplantation**
Balázs Tamás Németh, Kálmán Benke, Alex Ali Sayour, Bence Károly Ágg, Attila Oláh, Mihály Ruppert, Klára Stark, Miklós Pólos, István Hartyánszky, Béla Merkely, Zoltán Szabolcs, Tamás Radovits (Budapest, Hungary)
- 6. Effect of cardiorespiratory fitness on comorbidities and mortality in never, past and current smokers**
Nóra Sydó^{1,2}, Tibor Sydó³, Júlia Érdi², Dávid Major², Nasir Hussein¹, Karina Gonzalez Carta¹, Joseph G. Murphy¹, Béla Merkely², Francisco Lopez-Jimenez¹, Thomas G. Allison¹ (¹Rochester, MN, USA; ²Budapest, Hungary; ³Veszprém, Hungary)
- 7. The impact of permanent pacemaker implantation after transcatheter aortic valve implantation on long-term survival / Vpliv stalnega srčnega spodbujevalnika po transkatetrski vstavitvi aortne zaklopke na dolgoročno preživetje**
Polonca Kogoj, Jana Ambrožič, Matjaž Bunc (Ljubljana, Slovenia)



REGISTRATION AND INFORMATION

PRIJAVE IN INFORMACIJE

Združenje kardiologov Slovenije (ZKS)

Štukljeva cesta 48, SI-1000 Ljubljana

Mrs. Saša Radelj

T: 01 43 42 100, F: 01 43 42 101, e-mail: sasa.radelj@sicardio.org

REGISTRATION FEES FOR THE ENTIRE MEETING

KOTIZACIJE ZA CELOTNO SREČANJE

	Znesek / Fee (EUR)
Members of the SSC (with paid membership fee) Člani ZKS (s plačano članarino)	200
Participants not being members of the SCC Udeleženci, ki niso člani ZKS	250
Residents under 35 years of age, nurses, health technicians Specializanti do 35 let, med.sestre, tehniki	120
Retired members of the SSC, students Upokojeni člani ZKS, študenti	Free / Oproščeni

*ZKS – Združenje kardiologov Slovenije / SSC – Slovenian Society of Cardiology

Registration Fee should be paid on the Transaction Account of the Slovenian Society of Cardiology / Kotizacijo nakažite na transakcijski račun Združenja kardiologov Slovenije

Bank: Nova Ljubljanska bank d.d. Ljubljana, IBAN: SI56 0222 2001 8629 680, with notification »26AACM« and the surname of the participant.

Participants will receive Certificates of Attendance; accreditation of the event by the Medical Chamber of Slovenia is currently in process.

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26. LETNO SREČANJE ZDRUŽENJA KARDIOLOGOV ALPE – JADRAN

BOOK OF PAPERS KATALOG ČLANKOV





Multimodality imaging in valvular heart disease

Tomaž Podlesnikar

Department of Cardiology; Heart and Lung Center; Leiden University Medical Center, Leiden, The Netherlands

Valvular heart diseases (VHD) represent an important public health problem in Western countries (1). Among patients with moderate and severe native VHD included in the Euro Heart Survey the most frequent valvular lesions were aortic stenosis and mitral regurgitation (2). Transthoracic echocardiography (TTE) is the first-line imaging modality to determine the mechanism and severity of VHD as well as the degree of accompanying cardiac chamber remodeling and dysfunction (3,4). However, in some patients the quantification of valvular dysfunction remains challenging and the use of other imaging techniques such as 3D transesophageal echocardiography (TEE), cardiovascular magnetic resonance (CMR) and computed tomography (CT) is needed. In patients with aortic stenosis and concomitant left ventricular systolic dysfunction dobutamine stress echocardiography and calcium score with CT can help to differentiate between true severe and pseudosevere aortic stenosis (5). In secondary (functional) mitral regurgitation 3D vena contracta area with TEE and CMR-derived volumetric methods can provide more reliable quantification of mitral regurgitation severity (6-8). The integration of multimodality cardiovascular imaging is crucial for patient selection and procedural guiding in transcatheter valve repair and replacement therapies. Multi-slice CT has become the imaging modality of choice for pre-procedural evaluation of transcatheter aortic valve replacement (TAVR) candidates in most centers due to its low invasiveness and comprehensive evaluation (3). It allows assessment of the size and the shape of the aortic annulus, its distance to the coronary ostia, the distribution of calcifications and the dimensions of the aortic root, which are of paramount importance to determine feasibility of TAVR and to choose the appropriate prosthesis size (9). CT also allows assessment of the peripheral arteries to determine feasibility of transfemoral access for TAVR. 3D TEE is crucial to guide percutaneous edge-to-edge mitral valve repair (MitraClip) (10). Hybrid imaging (combination of TEE with fluoroscopy) allows real-time image fusion of high quality during structural heart disease interventions, greatly facilitating communication between team members, reducing radiation dose and the use of ionizing contrast (11). In conclusion, the aim of multimodality imaging in VHD is to improve the accuracy of diagnosis, to impact on therapeutic management and to improve patients' outcome. It needs to be employed wise, taking into consideration the costs and benefits of each technique.

References

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5. Baumgartner HC, Hung JC-C, Bermejo J, et al. Recommendations on the echocardiographic assessment of aortic valve stenosis: a focused update from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. *Eur Heart J Cardiovasc Imaging* 2017;18:254-75.
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Independent predictors of in-hospital mortality in ST-elevation myocardial infarction (STEMI) patients with a high-risk profile

Andreja Sinkovič^{1,2}

¹Department of Medical Intensive Care, University Medical Centre Maribor;

²Medical Faculty, University of Maribor, Maribor, Slovenia

Background. Patients with ST-elevation myocardial infarction (STEMI) is a heterogeneous group with a different risk profile, affecting in-hospital survival. Different risk scores can be calculated – in particular in the catheterization laboratory - to predict in-hospital mortality in STEMI patients, using variables such as older age, comorbidities, heart failure on admission, anterior STEMI or left bundle branch block (LBBB), time to primary percutaneous coronary intervention (PPCI), etc.

Aim. Our aim was to evaluate individual independent predictors of in-hospital mortality after admission of STEMI patients to the medical ICU, considering also important risk factors of mortality such as resuscitation before admission, TIMI flow after PPCI, in-hospital complications such as pulmonary edema and cardiogenic shock, reinfarction, in-stent thrombosis, bleedings and acute kidney injury.

Methods. We retrospectively included 478 high-risk STEMI patients (66,9% men, mean age 63.9 ± 11.8 years), admitted in 2015 and 2016 to the Dept. of medical ICU, treated by PPCI. Between survivors and nonsurvivors we compared clinical data, treatments and in-hospital complications.

Results. In admitted STEMI patients we observed frequently comorbidities (arterial hypertension in 57.9%, diabetes in 22.5%, prior myocardial infarction (MI) in 12.8%), age ≥ 65 years in 44.4%, time to PPCI > 12 hours in 19.1%, anterior STEMI in 48.4%, admission pulmonary edema in 7.6% and shock in 9.9%, prior resuscitation in 16.2%, PPCI performed in 92.5%, TIMI III flow achieved in 85.7%, in-hospital pulmonary edema in 9.3% and shock in 19.6%, in-hospital bleedings in 5.5%, in-stent thrombosis in 1.3%, acute kidney injury (AKI) in 13% and in hospital mortality in 14%.

Comparing nonsurvivors to survivors we observed significantly more likely age ≥ 65 years (62.7% vs 37.5%, $p < 0.05$), admission pulmonary edema (25.4% vs 4.6%, $p < 0.05$) and cardiogenic shock (40.3% vs 4.9%, $p < 0.05$), resuscitation before admission (47.8% vs 11.1%, $p < 0.05$), in-hospital pulmonary edema (31.8% vs 5.4%, $p < 0.05$) and cardiogenic shock (80.6% vs 9.6%, $p < 0.05$), acute kidney injury (55% vs 6.8%, $p < 0.05$) and bleedings (15.2% vs 3.9%, $p < 0.5$) and significantly less likely PPCI (85.1% vs 93.7%, $p < 0.05$) with less likely achieved TIMI III flow (70% vs 87.9%, $p < 0.05$), in particular within the first 12 hours of STEMI (61.9% vs 83.9%, $p < 0.05$).

Most significant independent predictors of in-hospital mortality as assessed by logistic regression (Wals statistics) were time to PPCI > 12 ur (OR 0.162, 95% CI 0.042 do 0.628, $p = 0.008$), admission cardiogenic shock (OR 5.481; 95% CI 1.097 to 27.384; $p = 0.034$), in-hospital pulmonary edema (OR 6.093; 95%CI 1.257 do 29.541; $p = 0.025$) and cardiogenic shock (OR 18.127; 95% CI 4.672 do 70.326; $p < 0.001$), bleedings (OR 12.242; 95%CI 2.159 do 69.428; $p = 0.005$) and acute kidney injury (OR 6.0; 95%CI 1.546 do 23.388; $p = 0.01$).

Conclusion. In-hospital mortality of STEMI patients with increased risk profile was most significantly and independently predicted by in-hospital complications, in particular by cardiogenic shock.



The impact of permanent pacemaker implantation after transcatheter aortic valve implantation on long-term survival

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Department of Cardiology, Division of Medicine, University Medical Centre Ljubljana, Slovenia

Background. Transcatheter aortic valve implantation (TAVR) has become the treatment of choice for inoperable patients with severe aortic stenosis and a good alternative for those at high and intermediate surgical risk. The need of permanent pacemaker (PM) is one of the most frequent periprocedural complications. We evaluated the survival of TAVR patients according to the need of PM after TAVR.

Methods. We retrospectively analyzed all patients that underwent TAVR from 1.1.2011 to 31.12.2015 in our institution. We divided them in two groups based on the need (PM group) or not need (no PM group) of PM after TAVR. The patients who required PM before TAVR were excluded. We compared clinical and echocardiographic parameters and 5-years survival in both groups.

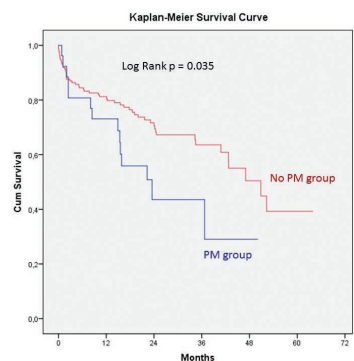
Results. Among 186 included patients, 26 required PM after TAVR (14.0 %). Patients in PM group suffered more often for renal impairment. There were no other differences in baseline clinical characteristics (Table 1) and echocardiographic parameters (left ventricular ejection fraction, aortic valve area, mean aortic gradient, systolic pulmonary arterial hypertension) before and after TAVR between the two groups. Patients in PM group had worse survival in comparison to patients in No PM group (Figure 1).

Conclusion. Our study demonstrated that PM implantation after TAVR is associated with worse survival of high risk patients with severe aortic stenosis.

Table 1. Baseline clinical characteristics.

	PM group, n = 26	No PM group, n = 160	Sig.
Logistic EuroSCORE, %	15.2 ± 11.3	14.0 ± 10.5	NS
Age, year	82.2 ± 4.3	82.8 ± 6.6	NS
LVEF before TAVR, %	55.6 ± 15.8	58.2 ± 12.4	NS
NYHA III or IV, n (%)	19 (73.1)	115 (71.9)	NS
Creatinine level > 2 mg/dl, n (%)	2 (7.7)	7 (4.4)	p < 0.05
Coronary artery disease, n (%)	12 (46.2)	59 (36.9)	NS
Chronic obstructive pulmonary disease, n (%)	8 (30.8)	31 (19.4)	NS
Atrial fibrillation/flutter, n (%)	14 (53.8)	57 (35.6)	NS
Previous coronary bypass surgery, n (%)	8 (30.8)	31 (19.4)	NS

Figure 1. Kaplan-Meier Survival Curve of patients in PM group and no PM group.



Relationship between repolarization heterogeneity and ventricular tachyarrhythmias in patients with CRT

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Background. Cardiac resynchronization therapy (CRT) has shown to induce left ventricular (LV) mechanical reverse remodelling and electrical remodelling. However, the effects of CRT on ECG parameters of ventricular repolarization are not well defined. The aim of our study was to analyze change of ventricular repolarization after CRT implantation and its relation to ventricular tachyarrhythmias (VTs) during long-term follow-up.

Methods. We prospectively included 64 heart failure patients (age 63.9 ± 10.9 years, 47 (73%) males) who had implanted CRT device between April 2012 and April 2015. Before the implantation and at follow-ups (at 1, 3, 6, 9 and 12 months after implantation) 20-minutes high-resolution Holter ECG was recorded during native conduction. At follow-ups, CRT was temporarily reprogrammed to VVI 40 bpm to allow native conduction. Following repolarization parameters were analyzed: QTc, TpTe interval (T peak to T end interval) and TpTe/QT ratio. Responders to CRT were defined by a decrease in left ventricular end-systolic volume of $\geq 15\%$ at 12 months follow-up echocardiography. Patients were follow-up (median time 44 months (range 21-52)) after implantation for occurrence of VTs.

Results. Significant differences in repolarization parameters over 12 months were observed between responders (33 patients (51.6%)) and nonresponders ($P < 0.05$). In both group, significant increase of repolarization parameters were observed at 1 month after CRT compared to pre-implant ($P < 0.05$). However, in responders decline of repolarization parameters were noted during further follow-ups. Whereas, in non-responders progressive increase of repolarization parameters at follow-ups compared with pre-implant value were observed ($P < 0.05$). Patients with VTs during long-term follow-up had higher repolarization heterogeneity at 12 months follow-up than patients without VTs (TpTe/QT ratio: 0.263 [0.204-0.278] vs. 0.225 [0.204-0.239]; $P = 0.045$). In multivariate Cox regression analysis only high repolarization heterogeneity at mid-term follow-up (TpTe/QT ratio > 0.260) was independently associated with high risk of VTs (hazard ratio 4.29; 95% CI 1.40-13.15; $P = 0.011$).

Conclusion. CRT induces time dependent changes in repolarization parameters in first 12 months after implantation. High repolarization heterogeneity at 12 months follow up was associated with higher rate of VTs during long-term follow-up.



Cardioneuroablation in ictal asystole – new proposed treatment modality

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Case Report. 43-year-old-male patient with known pharmacoresistant focal epilepsy was admitted to Department of Neurology for evaluation of recent deterioration of seizures resulting in syncope and traumatic injuries. During video-electroencephalography (EEG) monitoring several focal seizures were recorded. In the late postictal period, EEG pattern indicative of cerebral hypoperfusion with simultaneous prolonged asystole were followed by patient's syncope. As success of surgical treatment of epilepsy was estimated to be low we considered cardioneuroablation. Three-dimensional anatomy of the right (RA) and left atrium was created using intracardiac ultrasound (CARTOSound, Biosense Webster). The course of the right phrenic nerve was tagged onto the map of the RA. Afterwards, the electrogram fractionations indicative of epicardial ganglia presence were mapped and tagged in the common anatomic areas where parasympathetic ganglia innervate sinus and AV node. Multiple ablations were performed in the target areas. Slight increase of basic heart rate during ablation and only moderate increase in heart rate after atropine test indicated successful parasympathetic denervation of the sinus node. The procedure abolished bradyarrhythmia occurrence (monitored by implantable loop recorder Reveal Linq, Medtronic) and converted patient's dramatic seizures with severe cerebral hypoperfusion into short focal seizures with minimal motor signs.

Discussion. To the best of our knowledge, this is the first report of successful cardioneuroablation procedure to potentially treat selected patients with ictal asystole. Seizure-induced asystole, or ictal asystole, is caused by spread of ictal activity to loci where it intervenes with central autonomic networks which could result in direct vagal stimulation of the cardiac conduction system. It is estimated that only 0.27% of epileptic patients suffer from the condition, which is hypothesized as one of many potential mechanisms of sudden unexpected death in epilepsy (SUDEP)¹. Several approaches are proposed to treat ictal asystole, including adjustment of antiepileptic drugs, epilepsy surgery for medically refractory patients, and only recently permanent pacemaker implantation.² However, long-term ventricular pacing has been associated with potential detrimental effects on heart function and with substantial complication rates, despite the modern technological development of implantable electronic cardiac devices. Cardioneuroablation is an emerging treatment option for cardioinhibitory neurocardiogenic syncope, functional sinus node dysfunction and functional atrioventricular block with promising long-term results and no major abnormalities except mildly elevated basal heart rate. This minimally invasive technique is based on radiofrequency ablation of the main epicardial parasympathetic ganglia in the heart with an aim to modify the abnormally enhanced cardiac vagal tone.³ Although in our case, cardioneuroablation procedure considerably diminished patient's seizure presentation longer follow-up and close monitoring of the patient is required to detect possible recurrence of bradyarrhythmias and worsening of seizures. Nevertheless, cardioneuroablation might represent a new treatment modality in select pharmacoresistant patients with ictal asystole. In addition, permanent pacemaker implantation in such patients could be avoided and device-related complications prevented. Further research is warranted to evaluate this treatment option.

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A classical twin study of coronary plaque composition and plaque burden

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Introduction. Genetic factors have a considerable role in CAD development, heritability of coronary artery disease (CAD) is estimated to be between 40% and 60%. The increased quantity and lipid-rich composition of coronary atherosclerotic plaques are associated with increased cardiovascular risk. In this study our goal was to determine the degree of heritability of coronary plaque burden and composition in a classical twin study.

Methods. 60 twins (14 monozygotic (MZ) and 16 dizygotic (DZ) pairs) from the Genetic Loci and the Burden of Atherosclerotic Lesions (GLOBAL) Study (NCT01738828) were included. All twins underwent coronary CT angiography for plaque characterisation and quantification. We measured total plaque volume, calcified and non-calcified plaque volume in the LM, LAD, LCx, OM1 and RCA in segments more than 2 mm in mean lumen diameter. Concordance between MZ and DZ pairs were assessed using Pearson correlations. Broad heritability was calculated based on inter-twin correlation values according to the Falconer-method [$h^2=2*(r_{MZ}-r_{DZ})$].

Results. The mean age of the twins was 55.7 ± 10.1 years and 60% of the twins were females. Median total plaque volume was 611.4 (IQR: 540.2-709.2) mm³; median calcified plaque volume was 77.5 mm³ (IQR: 33.5-130.4 mm³) and median non-calcified plaque volume was 537.4 mm³ (IQR: 380.5-605.6 mm³). Total plaque volume showed strong correlation between MZ twins $r_{MZ}=0.78$, while between DZ twins the correlation was weaker $r_{DZ}=0.46$, similarly to that of calcified plaque volumes ($r_{MZ}=0.67$ and $r_{DZ}=0.32$). However, non-calcified plaque volume showed relatively strong correlations between both MZ and DZ twins ($r_{MZ}=0.78$ and $r_{DZ}=0.61$). The broad heritability of total plaque volume and calcified plaque volume was moderate ($h^2=0.64$ and $h^2=0.71$, respectively), whereas the heritability of non-calcified plaque volume was weaker ($h^2=0.35$).

Conclusion. Our initial results indicate that total plaque and calcified plaque volume have strong heritability. On the contrary, non-calcified plaque volume, as a marker of disease initiation, seems to be less determined by genetic factors. This may be consistent with a hypothesis that lifestyle factors, such as diet, could be important in the initiation of CAD, which may lead to more advanced disease on a susceptible genetic background. Further studies are needed to confirm this observation.



Differentiation of hypertrophic cardiomyopathy and athlete's heart using cardiac magnetic resonance imaging

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Differentiation between hypertrophic cardiomyopathy (HCM) and physiological hypertrophy due to regular intensive training and may cause difficulties. Left ventricular parameters and derived geometrical indices evaluated using cardiac magnetic resonance (CMR) may help to distinguish between these conditions.

HCM patients (n=194), elite athletes (n=150) with training a minimum of 18 hours per week, and athletes with HCM (n=10) were examined by CMR. Beside the traditional left ventricular CMR parameters derived parameters such as maximal end-diastolic wall thickness to left ventricular end-diastolic volume index ratio (EDWT/LVEDVi) and left ventricular mass to left ventricular end-diastolic volume ratio (LVM/LVEDV) were calculated. The parameters were established using both conventional quantification (CQ) and a threshold-based quantification (TQ) method, which enables quantification of trabeculae and papillary muscles.

Whereas 47.5% of male athletes, only 4.1% of female athletes were in the grey zone of borderline hypertrophy (EDWT 13-16 mm). EDWT/LVEDVi in males and females discriminated between physiological and pathological LV hypertrophy with the highest diagnostic accuracy (AUC CQ: 0.997 and 1.00, AUC TQ: 0.998 and 1.00). Cut-off value for ratio of LVM/LVEDVCQ less than 0.82 g/ml and cut-off value for LVM/LVEDVTQ g/ml less than 1.27 discriminated between physiological and pathological LV hypertrophy with a sensitivity of 77.8% and 89.2%, a specificity of 86.7% and 91.3%, respectively. According to our cut-off values LVMTQ/LVEDViTQ was the only parameter in the pathological range in all of our athletes with HCM.

LVM/LVEDV evaluated using TQ performed significantly better than CQ in both genders and also in the male subgroup with EDWT between 13-16mm ($p<0.001$).

Almost 50% of male highly trained athletes can reach EDWT of 13 mm. Derived CMR parameters can provide an important tool to distinguish HCM from athlete's heart, especially in highly trained athletes in the grey zone of hypertrophy.

Left ventricular reverse remodeling after transcatheter aortic valve replacement as assessed by cardiac CT angiography

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Introduction. Aortic valve stenosis (AS) causes pressure overload to the left ventricle (LV), resulting in LV hypertrophy and remodeling. Transcatheter aortic valve implantation (TAVI) has emerged as a safe and effective treatment alternative for intermediate to high risk patients with severe AS. Reverse remodeling after TAVR might improve patients' prognosis and functional status. Therefore, we aimed to evaluate the impact of TAVR on LV remodeling as measured by CT angiography. Furthermore, we sought to assess independent predictors of reverse remodeling, including hypo-attenuated leaflet thickening (HALT) as detected on follow-up CT images.

Methods. We performed 256-slice CT angiography for TAVR planning and follow-up. We measured LV mass and mass index on serial CT images based on epi- and endocardial contours. Reverse remodeling was defined as reduction in LV mass. HALT was evaluated using a consensus read of 3 experienced radiologists. We recorded patients' risk factors along with echocardiographic and CT characteristics. Multivariate linear regression analysis was performed to identify the independent predictors of reverse remodeling.

Results. A total of 80 patients were included in our study. We found significant reduction in LV mass index after TAVR procedure: 102.3 (80.4-121.6) grams/m² for pre- and 74.5 (62.1-87.7) grams/m² for post-TAVR, respectively, p<0.001. More than 20% reduction in LV mass was found in 66% of the patients. On multivariate linear regression analysis we found that HALT was an independent factor of LV remodeling over age, gender, paravalvular leak and traditional risk factors (hypertension, dyslipidemia, BMI and diabetes mellitus): Beta coefficient -16.4, p=0.040.

Conclusions. Significant regression of LV mass was observed after TAVR procedure. HALT was an independent predictor of reverse remodeling and demonstrated an inverse association with beneficial structural changes.



Exercise training in adults after tetralogy of Fallot repair

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Introduction. Exercise training significantly improves various cardiovascular parameters and reduces cardiovascular morbidity and mortality in different cardiovascular patients. There are few studies on adults after tetralogy of Fallot repair in which effects of exercise training were examined. However, there are no studies comparing effects of interval versus continuous exercise training in this population.

Methods. In the randomised controlled trial we have assigned patients into three groups, as follows: high-intensity interval training, moderate continuous training, and usual care (control) group. Both intervention programmes included 36 sessions, 2-3 times per week. Before and after the intervention period following cardiovascular parameters were investigated: exercise capacity (cardiopulmonary exercise testing), vascular function (flow-mediated dilation and carotid artery stiffness), cardiac autonomic function (heart rate variability and heart rate recovery), biomarkers (NT-proBNP, fibrinogen and lipid status) and health-related quality of life (SF-36 questionnaire).

Results. Thirty patients were included in the study, of which 27 completed the study, 9 in each group. Patients' mean age was 39 ± 9 years, 37% were males. Both exercise training protocols were safe, no side effects were reported. Only interval training significantly improved peak $\dot{V}O_2$ (from 21 to 23 ml/kg/min, $p=0.004$), flow-mediated dilation, carotid artery stiffness, NT-proBNP (from 202 to 190 pg/ml, $p=0.032$), fibrinogen and HDL levels. Conversely, only continuous training improved parameters of heart rate variability, heart rate recovery 2 min post-exercise, and mental domain of health-related quality of life questionnaire.

Conclusion. Exercise training is safe and efficient in adults after tetralogy of Fallot repair. Both types of training positively affected different cardiovascular parameters. While interval training seems more efficient in improving exercise performance, vascular function and disease-specific biomarker levels, continuous training seems more efficient in improving cardiac autonomic function and perceived quality of life.

Medical engineering as a patient-specific planning support system in complex cardiac surgical cases - Case series

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The increasingly rapid progression of new technology fosters an environment of innovation and change that must lead to some new personalized surgical opportunities in surgery. The bridge between the computer imaging techniques and surgical specialties is the quantitative modeling with possibility of analyzing the predicted postoperative results before the first incision. We report the application of patient-specific 3D models as a surgical planning support to plan the treatment of complex cardiac surgical cases. Clinically acquired images were used to set up patient-specific anatomical and computational models for finite element and computational fluid dynamics analyses.

The 3D geometry was reconstructed from computed tomography or magnetic resonance images in specific cases. Although every surgeon cogitates in 3D and use their stereopsis ability during preparation for operation but simply two dimensional records were pretended by the routine computer tomography and magnetic resonance images. To resolve this problem 3D models and computational calculations were performed before every complicated cases in our practice. The short, and long-term results of this type of surgical interventions - based on 3D reconstruction and/or computational calculations - proved excellent clinical accuracy. Our method was used to assist in clinical decision-making, training, and consultation between medical specialties.

Three different type of surgical cases are presented in our work. The first is a left ventricle aneurysm case after the Computer Assisted Ventricle Engineering (CAVE) procedure. The second is post-deep sternal wound infection complication case where the 3D printed model was used during the surgical intervention to separate the pseudoaneurysm from sternum closure wire. In the third case, a synovial sarcoma is presented in position of anterior leaflet of mitral valve. Extension and accurate localization of the sarcoma was calculated with our developed Matlab script, using MR Dicom files. Considering the calculation, a 3D model was printed with a two-armed printer, where the tumor mass is show-through the external surface, taking into account of tumor's border. Based on the planning, the synovial sarcoma was removed completely without recurrence within the following one year.



Pharmacological stimulation of the NO/SGC/cGMP pathway reduces ischemia-reperfusion injury and improves donor organ function in a rat model of heterotopic heart transplantation

Balázs Tamás Németh, Kálmán Benke, Alex Ali Sayour, Bence Károly Ágg, Attila Oláh, Mihály Ruppert, Klára Stark, Miklós Pólos, István Hartyánszky, Béla Merkely, Zoltán Szabolcs, Tamás Radovits

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Introduction. Despite the fast evolution of mechanical circulatory support devices, heart transplantation (HTX) remains the definitive therapy of end-stage heart failure. Ischemia-reperfusion (I/R) injury occurring during transplantation is a primary determinant of long-term outcome of HTX and primary graft insufficiency. The most important pathobiochemical changes induced by reperfusion in the myocardium of the donor organ are increased production of reactive oxygen species (ROS), intracellular Ca²⁺ overload, energy deficit and acidosis. Modification of the nitric oxide (NO)/soluble guanylate cyclase (sGC)/cyclic guanosine monophosphate (cGMP) signaling pathway appears to be the most promising among the pharmacological interventional options developed recently. The first clinically applicable member of this group is the sGC stimulator riociguat. We aimed at characterizing the cardio-protective effects of this drug in a rat model of heterotopic heart transplantation.

Methods. Donor Lewis rats were treated orally with either riociguat (10mg/BWkg) or placebo for two days. Hearts were stored for an hour in cold preservation solution (Custodiol) following explantation, then were transplanted heterotopically. One hour after initiation of reperfusion, left ventricular (LV) pressure-volume relations and coronary flow were recorded in order to assess post-transplant graft function. Molecular biological measurements and histological examination were also completed.

Results. LV contractility (LV systolic pressure at 120µl of LV volume: 117±13 vs. 48±5mmHg, p<0.001; dP/dtmax: 2963±221 vs. 1653±159mmHg, p<0.001) and active relaxation (dP/dtmin at 120µl of LV volume: -2014±305 vs. -1063±177mmHg, p=0.019) improved significantly after an hour of reperfusion, while alteration of coronary flow standardized to heart weight (2.52±0.34 vs. 1.67±0.22ml/min/g, p=0.06) was a trend following pretreatment with riociguat. Myocardial expression of antioxidant markers were significantly improved after heart transplantation.

Conclusions. Pharmacological preconditioning with riociguat decreases I/R injury and improves donor organ function in our small animal model of heart transplantation. The observed cardio-protective effect might be attributed to the stimulated sGC and increased myocardial cGMP-signaling. Riociguat therefore might be a potential cardio-protective agent in the inventory of heart transplantation surgery and during cardiac surgical procedures requiring sustained ischemia.

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Fragmented QRS in hypertrophic cardiomyopathy – myocardial scar marker?

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Introduction. Structural changes of myocardium, such as myocardial fibrosis, in hypertrophic cardiomyopathy (HCM) are associated with electrophysiological abnormalities, e.g. pathological Q-wave or fragmented QRS (fQRS). Cardiac magnetic resonance (CMR) is the only non-invasive method used to detect and quantify the myocardial fibrosis.

Purpose. Aim of our study was to investigate the correlation between fQRS, Q wave and CMR characteristics in HCM, and their prognostic role.

Methods. In this study we investigated 85 consecutive patients (47 male; 48.4±16.2 years) with HCM, who underwent CMR with late gadolinium enhancement and standard 12-lead ECG. Using cine short-axis images we evaluated left ventricular ejection fraction, volumes, mass and maximal end-diastolic wall thickness (MaxEDWT). On delayed contrast enhancement images the myocardial fibrosis was quantified. Standard 12-lead ECG records of patients with HCM were analysed. During clinical follow-up adverse cardiac events and cardiac complaints were recorded.

Results. Pathological Q-wave was detected in 23 (27%) patients, fQRS was present in 35 (41%) patients. Patients with fQRS had more myocardial fibrosis (26.1±30.5 vs. 14.6±20.3 g, p<0.05) and higher MaxEDWT (22.8±5.7 vs. 19.9 ± 5.6 mm, p<0.05). There was no difference in the amount of fibrosis and MaxEDWT between patients with and without pathological Q-wave.

During clinical follow-up (881 ± 619 days) one patient died, two patients had adequate ICD therapy, 17 further patients were hospitalized because of arrhythmia, heart failure, syncope or chest pain. Patients with fQRS had more often syncope compared to patients without fQRS (53.3% vs. 9.5%, p<0.01).

Conclusion. Although pathological Q-wave is traditionally considered a myocardial scar marker, we found no difference in the amount of fibrosis between patients with and without pathological Q-wave. In contrast, patients with fQRS had significantly higher amount of fibrosis. fQRS was also associated with higher maximal end-diastolic wall thickness and more frequent syncope.



Predictors of long-term mortality and reablation in patients undergoing ischaemic or non-ischaemic VT ablation

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Background. Radiofrequency (RF) ablation is an effective treatment in patients with monomorphic ventricular tachycardias (VTs). It is highly important to identify clinical factors predicting outcome after VT ablation. Our aim was to determine predictors of long-term all-cause mortality and reablation in patients undergoing VT ablation at our Clinic.

Methods. Between 1st of January 2005 and 31st of December 2016 VT ablation was performed in 200 patients with sustained monomorphic VTs (173 men (86.5%), age 68 [36-90], EF \leq 35% in 83 patients [41.5%]). 83% of patients had ischaemic heart disease. During the procedure after activation and voltage mapping of the left ventricle (LV), substrate and LAVA (local abnormal ventricular activity) ablation were performed. 16 patients underwent epicardial ablation (8%). Medical history, echocardiographic, procedural and follow up data was collected and analysed retrospectively. Ablation was considered successful, if during follow up no re-ablation was needed.

Results. The median follow up time was 1257 (4-4572) days, 120 patients died (60%). 41 patients needed reablation (20.5%). During multivariate Cox analysis, after adjustment of relevant clinical covariates, severe heart failure with NYHA IV functional stadium (HR: 0.64, CI: 0.42-0.96, $p=0.03$), presence of electrical storm (HR: 0.62, CI: 0.41-0.94, $p=0.02$) and right ventricular dysfunction characterised by TAPSE $<$ 17mm (Tricuspid annular plane systolic excursion) (HR: 0.53, CI: 0.33-0.85, $p=0.009$) independently predicted all-cause mortality. Kaplan-Meier curves showed significantly lower survival in patients with NYHA IV stadium heart failure ($p<0.001$), deteriorated RV function ($p=0.01$) and electrical storm ($p=0.004$). Regarding VT recurrence indicating reablation elimination of LAVA potentials was independently associated with lower number of reablations (HR: 0.62, CI: 0.41-0.94, $p=0.02$).

Conclusion. Apart from ICD implantation, VT ablation is an efficient and safe treatment option. Based on our results severe heart failure, RV dysfunction and electrical storm were independent predictors of long-term all-cause mortality. Moreover, LAVA elimination resulted in lower number of reablations.

Pharmacological stimulation of the NO/SGC/cGMP pathway reduces ischemia-reperfusion injury and improves donor organ function in a rat model of heterotopic heart transplantation

Balázs Tamás Németh, Kálmán Benke, Alex Ali Sayour, Bence Károly Ágg, Attila Oláh, Mihály Ruppert, Klára Stark, Miklós Pólos, István Hartyánszky, Béla Merkely, Zoltán Szabolcs, Tamás Radovits

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Effect of cardiorespiratory fitness on comorbidities and mortality in never, past and current smokers

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Introduction. Smoking is a strong risk factor for cardiovascular (CV) disease and mortality, but quitting may cause weight gain and increase the risk of comorbidities. Our aim was to investigate the effect of smoking and exercise on weight-associated comorbidities and mortality.

Methods. We included Minnesota residents without baseline CV disease who underwent exercise testing between 1993–2010. Mortality was determined from Mayo Clinic records and Minnesota Death Index. Total, CV and cancer mortality by smoking status and cardiorespiratory fitness (CRF): 1) < 80%, 2) 80–99%, 3) ≥ 100%. Differences were tested using logistic and Cox regression adjusting for age and sex.

Results. 21981 patients (7090 past, 2464 current smokers) were included. Past smokers had more obesity, hypertension, diabetes and low CRF compared to never smokers. Current smokers did not show increased risk factor prevalence compared to never smokers but had higher rates of low CRF. There were 1749 deaths; mean follow-up was 12±5 years. Mortality was only slightly increased in past vs never smokers (HR = 1.2; 95% CI: 1.12–1.38) but was much higher in current smokers (HR=2.4; 95% CI: 2.05–2.80). Mortality in never, past and current smokers was inversely related to CRF level.

Conclusions. Past smokers showed higher rates of comorbidities and low CRF, but mortality was only mildly increased vs never smokers, while current smokers carried a high mortality risk. Our data suggest that quitting smoking is beneficial despite the increased comorbidities. Exercise may potentially mitigate the risk of comorbidities and death in those who quit smoking.



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