

Abstracts

Belgian Society of Cardiology 28th Annual Scientific Meeting

Abstracts[°] selected for oral presentation (#) or poster display (Δ) and abstracts competing for the Young Investigator Award (*)

President: Professor Guy Berkenboom, M.D., Ph.D., FESC

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Heart failure and cardiac function

Mesp1 acts as a master switch during multipotent cardiovascular progenitor specification. # — Antoine Bondue, Gaëlle Lapouge, Cédric Blanpain (*IRIBHM, Brussels, Belgium*).

Background. During embryonic development, multipotent cardiovascular progenitor cells are specified from early mesoderm. Although the core cardiac transcriptional factor network acting during cardiac cell differentiation is relatively well known, the molecular mechanism acting upstream of these genes, and specifying cardiac progenitor cells from early mesoderm remains poorly understood.

Methods. We used embryonic stem cell (ESC) differentiation to dissect the molecular mechanisms impli-

cated in the specification of multipotent cardiovascular progenitors.

Results. Using ESCs, in which gene expression can be temporally regulated, we showed that Mesp1 acts as a critical regulator of multipotent cardiovascular specification from undifferentiated mesoderm. Transient expression of Mesp1 dramatically accelerated and enhanced specifically cardiovascular cell fate specification through intrinsic and cellular autonomous mechanism. Using genome wide transcriptional analysis, we found that Mesp1 rapidly activates and represses a discrete set of genes. Using chromatin immunoprecipitation, we showed that Mesp1 directly binds to regulatory DNA sequences located in the promoter of many key genes belonging to the core cardiac transcriptional machinery, including Hand2, Myocardin, Gata4, Nkx2-5 and Mef2c, resulting in their rapid upregulation. Mesp1 also directly and strongly

[°] printed in alphabetical order of the first author's name

repressed the expression of key genes that regulated pluripotency, early mesodermal and endodermal cell fate, as well as repressing its own expression, ensuring the unidirectionality and the specificity during cardiovascular cell fate specification induced by Mesp1.

Conclusions. Our results demonstrate that Mesp1 acts as a key regulatory switch during cardiovascular specification, residing at the top of the hierarchy of the gene network responsible for cardiovascular cell fate determination. This study provides novel and important insights into the molecular mechanisms underlying the earliest step of cardiovascular specification and provided a potentially novel and powerful method for dramatically increasing the number of cells for cellular therapy of human cardiovascular diseases.

Circulating endothelial progenitor cell numbers exhibit exercise-induced variation. # — Luc Bruyndonckx, Christophe Van Berckelaer, Geert Frederix, Andy Buys, Nadine Possemiers, Tom Vermeulen, Vicky Hoymans, Christiaan Vrints, Emeline Van Craenenbroeck, Viviane Conraads (*Antwerp University Hospital, Edegem, Belgium*).

Background. The benefits of physical training in healthy subjects as well as in patients with cardiovascular disease are related to both coronary and peripheral vascular effects. Endothelial progenitor cells (EPC) play an important role in endothelial repair and are released in ischemic conditions. However, the short-term effect of exercise on the release of EPC from the bone marrow has not been studied. The aim of the present study was to establish a time-curve of circulating EPC before and after a symptom-limited exercise test in healthy subjects (HS) and in patients with chronic heart failure (CHF). In addition, we assessed whether exercise affects the described diurnal variation of circulating EPC, which is characterized by an evening peak.

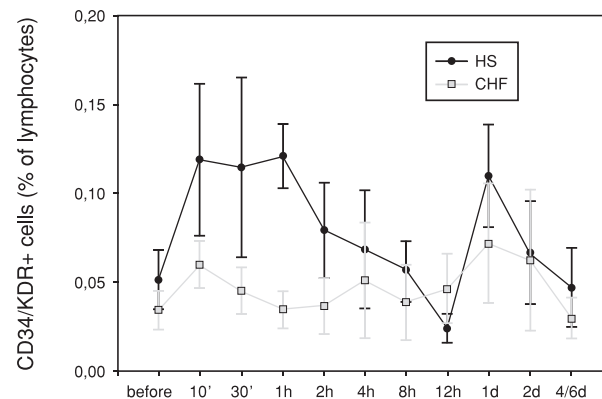
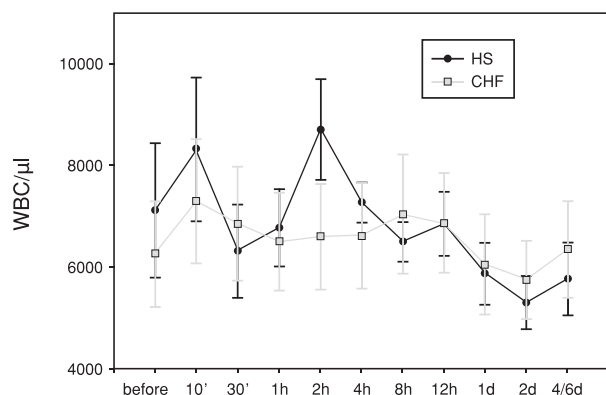
Methods. 8 subjects (4 HS, 20 ± 0.9 yrs, Watt max 265 ± 10 Watt and 4 CHF patients, 70 ± 5 yrs, left

ventricular ejection fraction $20 \pm 5\%$, Watt max 53 ± 10 Watt) underwent a symptom-limited exercise test on a bicycle ergometer with continuous ECG registration and blood pressure measurement. Venous blood samples were taken before, within 10 minutes after cessation of exercise and at 30', 60', 2 hrs, 4 hrs, 8 hrs, 12 hrs, 24 hrs, 2 days, and 4 or 6 days for respectively HS or CHF patients. During this period, subjects refrained from excessive exercise. Circulating EPC, defined as CD34⁺/KDR⁺ cells, were quantified immediately in whole blood by flow cytometry using a rigorous gating strategy.

Results. The results of both groups are shown in the figures below. Data are expressed as mean \pm standard error of mean.

An exercise-induced increase in **total leucocyte count** was observed in both groups ($p = 0.1$ for HS and $p = 0.01$ for CHF). Exercise is known to induce a second, delayed leucocytosis, which was clearly documented in HS, but remained absent in the CHF group. Circulating **EPC** increased acutely following exercise in HS ($5.15 \cdot 10^{-2}$ vs. $11.9 \cdot 10^{-2}$ % of lymphocytes $p = 0.1$) and remained elevated for one hour. Despite lower baseline levels in CHF patients, acute exercise elicited an increase in EPC ($3.46 \cdot 10^{-2}$ vs. $6.01 \cdot 10^{-2}$ % of lymphocytes $p = 0.2$) but returned to baseline after 1 hour. A raised level of EPC the next morning was seen in both groups, although still lower in CHF than in HS. Normal diurnal variation pattern of circulating EPC, characterized by an evening peak, was absent in both groups.

Conclusions. Acute exercise induces an increase in leucocyte and EPC numbers, which is larger and more prolonged in HS than in CHF patients suggesting a general exhaustion of progenitor cells within the bone marrow. Moreover, the present results might have consequences for the standardization of blood sampling in future EPC studies. In order to avoid intra-individual variability (acute increase, biphasic response, loss of diurnal variation), recent physical exercise at the time of blood sampling should be taken into account.



Sympathetic nervous system activation is an independent prognostic factor of clinical deterioration in pulmonary arterial hypertensive patients. Δ — Agnieszka Ciarka, Vi Phuong, Sandrine Huez, Jean-Luc Vachieri, Robert Naeije, Philippe van de Borne (*Erasmus Hospital, Brussels, Belgium*).

Background. Pulmonary arterial hypertension (PAH) is accompanied by increased muscle sympathetic nerve activity (MSNA), related to the severity of disease. We wanted to investigate whether MSNA is a prognostic factor in PAH patients.

Methods. We have included 33 PAH patients in the study, hospitalised between 2001 and 2007 in Erasmus University Hospital for evaluation of pulmonary hypertension. All the patients underwent right heart catheterisation, six minutes walk test (SMWT) and their functional NYHA class was evaluated. A MSNA recording was performed in the all patients. The mean follow up time was 57 ± 4 months. The patients were classified as survivors or clinically deteriorated (transplanted or dead).

Results. The deteriorated patients as compared to the survivors presented with increased MSNA (79 ± 3 vs. 52 ± 4 burst/min, $p < 0.0001$), increased heart rate (88 ± 4 vs. 74 ± 3 bpm, $p < 0.05$), lower SMWT (328 ± 30 vs. 434 ± 23 m, $p < 0.01$) and increased NYHA class (3.5 ± 0.1 vs. 2.9 ± 0.2 , $p < 0.05$). No difference was found between the hemodynamic variables between the two groups. MSNA was directly related to NYHA class, heart rate and inversely related to SMWT. An univariate analysis revealed that MSNA, heart rate, SMWT and class NYHA were associated with clinical deterioration. A multivariate analysis showed that MSNA was an independent predictor of clinical deterioration. For every increase of 1 burst per minute, the risk of clinical deterioration increased by 6%. The Kaplan-Meier curves revealed that patients with MSNA > 66 burst/min presented with decreased survival in comparison with those, who were characterised by MSNA < 66 bursts/min (log rank test, $p < 0.01$).

Conclusions. MSNA is an independent prognostic factor of death or major clinical deterioration justifying lung transplantation in PAH patients.

Heart failure and coping. Δ — Marijke De Winter¹, Hedwig Boudrez², Hans Vandekerckhove¹, Michel De Pauw², Lena Versée¹ (¹AZ Sint Lucas, Gent, Belgium, ²UZ Gent, Gent, Belgium).

Background. Heart failure is a cardiac disease with serious impact on the patients' quality of life. Little however is known about the relationship between the use of certain coping strategies and quality of life. A

first aim of this study was to give a description of medical and psychosocial features of stable heart failure patients who came for a cardiology consultation in the hospital. Secondly we studied the sample by means of their scores on quality of life and coping and by the association between both.

Methods. A quantitative, cross sectional analysis was performed. Data were collected from 98 patients with a LVEF $\leq 45\%$. The sample was 79.6% male and almost two thirds of the patients were in NYHA I or II. Quality of life was measured by the Minnesota Living with Heart Failure Questionnaire (MLWHFQ) and coping was assessed with The Brief COPE. Nurses were asked to complete a checklist in order to collect relevant medical data. For the statistical analyses T-tests, correlations and a regression were performed with SPSS.

Results. The sample was characterized by good levels of quality of life. More than 80% hardly used the coping strategies 'denial', 'unadapted change of behaviour' or 'self-reproach', while more than 60% frequently used 'acceptance', 'making use of emotional support' or 'reappointing in a positive way'. As shown in the table beneath, 'use of instrumental support', 'distraction', 'unadapted change of behaviour', 'verbal venting' and 'self-reproach' correlated significantly, though weakly, with quality of life.

Correlation of scores on coping strategies with the sumscore on the MLWHFQ

	(r)	Sig. (p-value)
Making use of instrumental support	0.23	0.028
Distraction	0.26	0.012
Verbal venting	0.22	0.030
Unadapted change of behaviour	0.40	< 0.001
Self-reproach	0.29	0.005

Conclusions. According to the results of the correlation analysis, the use of strategies like 'unadapted change of behaviour', 'self reproach' or distraction' deserve close attention when doing research about parameters for quality of life. Coping is an important prognostic factor when studying quality of life in heart failure: it is a good tool for caregivers in order to get better insight into the adaptive tasks of patients who are dealing with the disease.

Intracoronary injection of autologous CD34 + progenitor cells: impact on endothelial function in the chronic phase of myocardial infarction. Δ — Chantal Dedobbeleer, Didier Blocklet, Michel Tounouz, Micheline Lambermont, Philippe Unger, Jean-Paul Degaute, Serge Goldman, Guy Berkenboom (*University Hospital Erasme, Brussels, Belgium*.)

Background. Progenitor cells could contribute, by a paracrine effect, to the improvement of the vascular status in the infarcted area. The aim of the present study is to determine the effect of intracoronary implantation of CD34+ on the vasodilatation capacity of the culprit vessel in the chronic phase of myocardial infarction.

Methods. Seven patients (males; mean age: 62 ± 2 years) with a history of reperfused anterior myocardial infarction (stenting of the left anterior descending artery, LAD) and with an altered ejection fraction ($42 \pm 3\%$) were included in the study. Five patients had a bare-metal stent and two patients a pharmacological stent (iPaclitaxel-coated stent and Zotarolimus-coated stent). All patients were free of angina and treated by statin, aspirin and ACE inhibitor. Intracoronary infusion of purified CD34+ (PSC) was performed 20 ± 2 months (mean \pm SEM) after the acute event. Cytopheresis followed by immunomagnetic selection provided $20.3 \pm 2.4 \times 10^6$ CD34+ cells available for transplantation. These PSC were infused through the central lumen of an over-the-wire-balloon catheter placed at the stent level of the LAD. In these conditions, we have shown that $3.2 \pm 0.6\%$ of the injected PSC are homed in the border zone of the infarct area. The responses of the LAD to increasing doses of bradykinin (Bk, 60, 200 and 600 nanograms) and to isosorbide dinitrate (ISDN 200 micrograms) were assessed to evaluate the endothelium-dependent and-independent vasodilation (5 Fr interventional catheter, positioned in the left coronary artery ostium). Diameters of the LAD, 1 cm below the stent, were evaluated one minute after each injection by quantitative angiography. The vasomotor responses of the circumflex artery (Cx) were also assessed and served as control. Furthermore, the intimal thickening (total area-luminal area/total area) was assessed by ultrasound (IVUS) on the LAD segment. All measurements were performed at baseline and three months after transplantation on the same LAD segments.

Results. The Bk effect was expressed in percent of ISDN response, considered as an index of NO-mediated dilation. The vasorelaxation curves to Bk were similar at baseline and three months after transplantation in the LAD ($p = 0.99$). In Cx, there were also no differences between baseline and three months follow-up ($p = 0.20$) demonstrating the stable conditions of our patients. The intimal thickening was also not significantly modified: $46 \pm 3\%$ vs. $47 \pm 7\%$ at three months.

Conclusion. In the chronic phase of myocardial infarction, intracoronary injection of CD34+ progenitor cells isolated by cytopheresis was not associated with an improvement of the endothelial function in the infarct-related artery at three months follow-up.

PET imaging of peripheral stem cell homing after intracoronary transfer in patients following MI in acute and chronic conditions. # — Chantal Dedobbeleer, Didier Blocklet, Michel Tounouz, Micheline Lambermont, Philippe Unger, Jean-Paul Degaute, Serge Goldman, Guy Berkenboom (University Hospital Erasme, Brussels, Belgium).

Background. Transcoronary transplantation of progenitor cells seems to be a promising therapeutical approach of ischaemic cardiomyopathy. As the timing of the transplantation remains controversial, we aimed to compare the homing of these cells in acute and chronic conditions and also to assess the feasibility of a peripheral approach for CD34+ isolation (rather than bone marrow harvesting).

Methods. 13 patients (range age: 41 to 70 years) with a history of reperfused anterior myocardial infarction underwent intracoronary infusion of purified CD34+ cells 9 \pm 1 days ($n = 6$, group A) or 20 \pm 2 months ($n = 7$, group B). At baseline, the ejection fraction was lower in group B than in group A: $42 \pm 3\%$ vs. $56 \pm 3\%$ ($P < 0.05$). A large amount of CD34+ cells were obtained in each patient, without mobilization, by cytopheresis of a large volume of blood followed by immunomagnetic selection. In group A 14.9 ± 3.6 million CD34+ were available vs. 20.3 ± 2.4 million in group B. For each patient, 2 million of these cells were radiolabelled by 18-fluorodeoxyglucose. Cell viability after radiolabelling was above 95%. The labelled and non-labelled cells were infused through the central lumen of an over-the-wire-balloon placed at the stent level of the LAD. PET imaging study was performed 2 hours after cell transplantation.

Results. PET imaging detected myocardial radioactivity at the borders of the infarcted area in all patients. Homing of the radiolabelled injected stem cells was lower in group B: $3.2 \pm 0.6\%$ vs. $5.5 \pm 0.9\%$ in group A. Viability studied by PET imaging in each patient was comparable before and 3 months after transplantation in group B whereas it tended to increase in group A (qualitative assessment). Wall motion score index determined by echocardiography 3 months after transplantation was unchanged in group B (from 1.83 ± 0.10 to 1.76 ± 0.10 , NS) whereas in group A an improvement was observed (from 1.63 ± 0.12 to 1.40 ± 0.11 , $p < 0.05$). However, left ventricular ejection fraction did not change in any group (from $42 \pm 3\%$ to $44 \pm 3\%$ in group B, NS and from $56 \pm 3\%$ to $60 \pm 3\%$ in group A, NS). No restenosis or arrhythmia occurred in any patient after 3 months.

Conclusion. Intracoronary infusion of CD34+ progenitor cells in the chronic phase of myocardial infarction results in smaller myocardial homing than in acute conditions, likely explaining the absence of improvement in wall motion score index in the former

group. Larger studies are necessary to assess the best timing of stem cell therapy after myocardial infarction and also to evaluate the efficacy of the peripheral approach versus bone marrow harvesting for stem cell isolation.

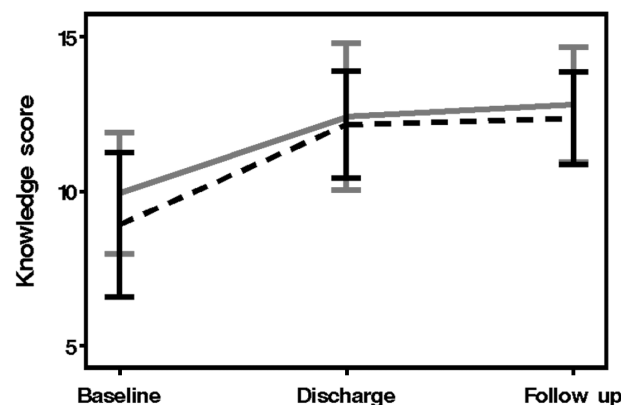
Comparison of a computer assisted learning program to standard education tools in hospitalised heart failure patients. Δ - Ann Dilles¹, Valerie Heymans¹, Sandra Martin², Stefaan Foulon², Walter Droogne², Kris Denhaerynck³, Sabina De Geest³ (¹Centre for health service and nursing research, Catholic University of Leuven, Leuven, Belgium, ²University Hospitals Leuven, Leuven, Belgium, ³Institute of nursing science, University of Basel, Basel, Switzerland).

Background. Education, coaching and guidance of patients are important components of heart failure management. The aim of this study is to compare a computer assisted learning program versus standard education (written information by brochure and oral information by nurses) on knowledge and self-care in hospitalised heart failure patients. Satisfaction with the computer assisted learning program in the intervention group was also assessed.

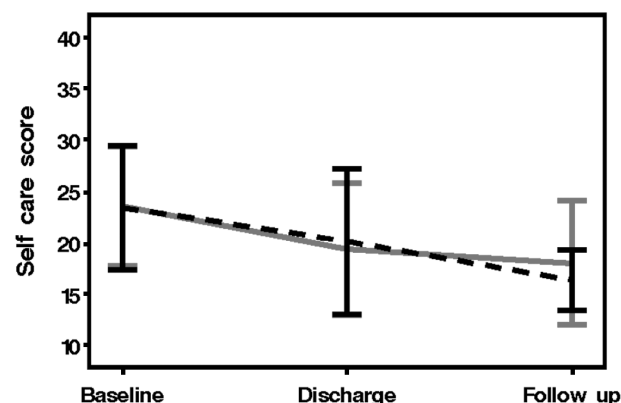
Methods. A quasi experimental design was used. This study included a convenience sample of in-hospital heart failure patients. Inclusion criteria were patients admitted with diagnoses of heart failure, older than 18 years, literate, Dutch speaking and able to understand and sign the informed consent. Patients were excluded if they had a score less than 25 on the Mini-Mental State Examination, had received heart failure education in the past and/or were in palliative care. Socio-demographic and clinical characteristics were obtained through medical record review. Knowledge, self-care and satisfaction were measured by means of the Dutch Heart Failure Knowledge Scale, the European Heart Failure Self-care Behaviour Scale and a self administered satisfaction questionnaire. Respectively knowledge and self-care were assessed at hospital admission, at discharge and after 3 months follow-up. Satisfaction about the computer assisted learning program was measured at hospital discharge by a self administrated questionnaire. The evolution of knowledge and self-care over time within groups was evaluated. The evolution of knowledge and self-care between groups was compared using a mixed regression model.

Results. 37 of the 65 screened heart failure patients were included in the study; 21 patients in the computer assisted learning group and 16 in the usual care group received a brochure. Over time, knowledge and self-care improved significantly within groups ($p < .0001$). There was no significant difference

in knowledge ($p = .65$) and self-care ($p = .24$) between groups.



Study group: — Intervention - - Usual care



Study group: — Intervention - - Usual care

Conclusions. In this study we were not able to find a significant difference in knowledge and self-care between two education strategies. The improved knowledge and self-care in the intervention group could be a consequence of the brochure and possibly not because of computer assisted learning. Further research is needed.

The Cardio-Renal Anemia Survey: results of a study in Belgian cardiology centres. Δ — Walter Droogne¹, Eric Nelessen², Patrick Peeters³, Jean-Luc Vachiéry⁴, Johan Vanhaecke¹ (¹UZ Gasthuisberg, Leuven, Belgium, ²CHU Sart Tilman, Liège, Belgium, ³UZ Gent, Gent, Belgium, ⁴CUB-Hôpital Erasme, Brussels, Belgium).

Background. Congestive heart failure, chronic kidney disease (CKD) and anemia form a vicious triangle in which each can cause or worsen the others, a phenomenon known as the cardio-renal syndrome. The

primary objective of this non-interventional study was to describe the documentation of parameters of anemia and renal function in the daily cardiology practice.

Methods. The following data were collected (if available) from consecutive patients consulting the participating cardiologists: NYHA classification, type of patient (ambulatory, elective/acute admission), age, sex, race, height, weight, treatment with an erythropoiesis stimulating agent (yes/no), hemoglobin (Hb), serum creatinine, and LVEF (Left Ventricular Ejection Fraction). Patients with major bleeding or recent major surgery were excluded.

Results. Of the 399 evaluable patients (from 11 Belgian centers) in the survey, 60% of patients were ambulatory and 40% were hospitalized (1/3 elective, 2/3 acute). Patients were on average 70 years of age with a male:female ratio of 2:1, and mostly in NYHA class II and III. LVEF, serum creatinine and Hb values were documented in 82-85% of patients. LVEF was $\leq 45\%$ in 71% of patients. Based on estimated glomerular filtration rate (eGFR), more than 60% of patients were in CKD stage 3-5 (i.e., eGFR < 60 ml/min/ 1.73 m 2), and these included more than half of the patients with an LVEF $\leq 45\%$. Mean Hb value was 13.0 g/dL. About 40% of male (Hb < 13 g/dL) and 36% of female patients (Hb < 12 g/dL) were anemic (WHO definition). As expected, Hb values decreased steadily, from 14.1 to 11.6 g/dL with worsening CKD stage (1-5). However, only 9% of patients were treated with an erythropoiesis stimulating agent.

Conclusions. This snapshot survey is a good indicator of the high prevalence of anemia and CKD in the daily cardiology practice. In most patients, Hb and renal function parameters were available, showing the potential for early detection of CKD by the cardiologist.

Bosentan improves exercise capacity in acute hypoxic subjects. # — Vitalie Faoro¹, Sandrine Huez²,

Saskia Boldingh³, Mickael Moreels¹, Sarah Martinez¹, Régine Bastin², Michel Lamotte², Philippe Unger², Serge Brimiouille⁴, Robert Naeije¹ (¹Laboratory of Physiology, Faculty of Medicine, Free University of Brussels, Brussels, Belgium, ²Department of Cardiology, Erasme University Hospital, Brussels, Belgium, ³VU University Medical Center, Amsterdam, Netherlands, ⁴Intensive Care Departement, Erasme University Hospital, Brussels, Belgium).

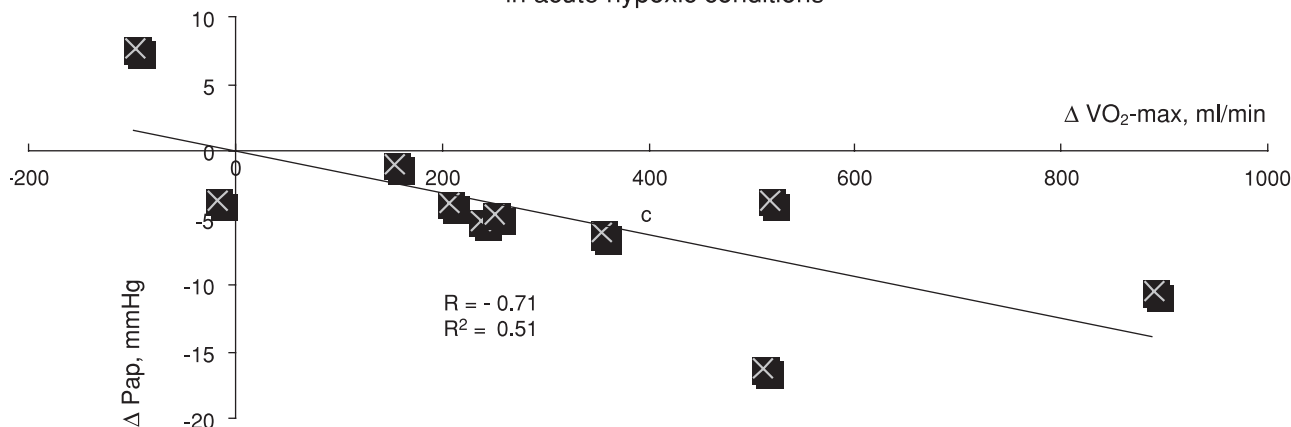
Background. Aerobic exercise capacity is decreased in hypoxia. We tested the hypothesis that hypoxic pulmonary vasoconstriction decreases aerobic exercise capacity because of a limitation of right ventricular flow output. Therefore, we investigated the effects of the endothelin receptor blocker bosentan, which is efficacious therapy in pulmonary hypertension, on hypoxia-induced pulmonary hypertension and maximum oxygen uptake (VO_{2max}), compared to placebo.

Methods. An cardiopulmonary exercise test and echocardiographic measurements of systolic pulmonary artery pressure (Ppa) and cardiac output (Q) were performed in 12 healthy volunteers in normoxia (N), after one hour of hypoxic breathing (AH) (fraction of inspired O_2 of 0.12), with or without bosentan intake, following a double blind randomised cross-over design. Bosentan was taken during three days at the dose of 62.5 mg bid the first day, followed by 125 mg bid the next two days.

Results. Hypoxia decreased arterial O_2 saturation (S_aO_2), had no effect on Q and increased Ppa together with a decrease in VO_{2max} . Bosentan had no effect on normoxic measurements, but decreased Ppa and increased VO_{2max} in hypoxia.

Conclusions. Bosentan therapy decreases pulmonary hypertension and concomitantly prevents the exercise capacity limitation during acute hypoxic exposure in healthy subjects.

Correlations between the effects of bosentan on Pap and VO_{2max} in acute hypoxic conditions



	N placebo	N bosentan	AH placebo	AH bosentan
rest Q, L/min	5.7 ± 0.4	6.2 ± 0.5	6.3 ± 0.4	6.8 ± 0.4
Ppa rest, mmHg	24 ± 1	25 ± 23	5 ± 2**	30 ± 2§§
VO ₂ max, ml/min/kg	47 ± 24	4 ± 23	5 ± 2***	39 ± 2**§§

Mean ± SE; ** $P < 0.01$, *** $P < 0.001$, effects of hypoxia; §§ $P < 0.01$, effects of bosentan
Bosentan-induced changes in Ppa and VO₂max were tightly correlated.

Diagnostic properties of Urocortin, an endocrine factor, in congestive heart failure. Δ — Damien Gruson, Sylvie Ahn, Jean-Marie Ketelslegers, Michel Rousseau (*Cliniques Universitaires St-Luc, Bruxelles, Belgium*).

Background. Urocortin (UCN), a member of the corticotrophin-releasing factor family, is involved in the modulation of endocrine, autonomic and behavioural responses to stress. Recent data suggests that UCN is a potent cardioprotective and vasoactive peptide which play a role in the physiopathological control of cardiovascular function. Furthermore, UCN mRNA is expressed in all four heart chambers and so may act as autocrine/paracrine factor. The aim of this study was to investigate the potential involvement of UCN in congestive heart failure (CHF) and its relationship with other CHF markers.

Methods. To clarify the potential value of UCN in CHF, we analysed plasma concentrations of UCN in 42 fully treated CHF patients (mean age: 64 ± 10 years; mean ejection fraction: 21 ± 6%). UCN was determined using a specific ELISA assay (Phoenix pharmaceuticals, Belmont, Ca, USA) after acidic extraction using Sep-Pak C18 columns. The circulating levels of Nt-proBNP, Nt-proANP and Big ET-1, well-established markers for diagnosis and prognosis of CHF, were also determined using specific immunoassays. Reference values for biomarkers were obtained from 20 healthy age- and sex-matched subjects. Unpaired Student t-tests and multivariate correlations on log transformed data were used for statistical analysis.

Results. In comparison with controls, UCN plasma concentrations (geometric mean [95% CI]) were significantly increased in CHF patients (88 pmol/L [75-105] vs. 46 [39-54], $p < 0.001$). As expected, the other studied neurohormones were also significantly increased in CHF patients (Nt-proBNP: 3501 pg/ml [2356-5202] vs. 35 [24-51], Nt-proANP: 5498 pg/ml [4336-6971] vs. 324 [255-411] and Big ET-1: 15.8 pg/ml [13.6-18.4] vs. 5.9 [5.2-6.8]; $p < 0.0001$ for all vs. controls). No significant correlation was observed between UCN and the other CHF markers.

Conclusions. Our results demonstrated that circulating concentrations of UCN, a cardioprotective and vasoactive peptide, are increased in CHF patients but without any significant correlation with Nt-proBNP,

Nt-proANP and Big ET-1. Further studies should be performed to confirm if UCN could be considered as a robust and independent biomarker for the diagnosis of CHF.

Follow-up results of single aortic valve replacement in 120 octogenarians. # — Hadewich Hermans, Paul Herijgers, Marie-Christine Herregods (*University Hospitals Leuven, Leuven, Belgium*).

Background. The number of octogenarians with an indication for aortic valve replacement (AVR) is increasing. Good outcomes in elderly patients are presented in the literature, but hesitancy remains to refer them for surgery. We describe the single-center results with emphasis on demographics, peri- and postoperative mortality and morbidity, and postoperative functional status.

Methods. 124 consecutive octogenarians underwent single aortic valve replacement between 10/1984 and 9/2005 in our center. MDs obtained clinical and operative variables by file review, and late outcome variables by written and telephone contact with patients and physicians. 4 were lost from follow-up, 120 remained for analysis. Mean follow-up was 41.75 months (range 0.15-157.67).

Results. Mean age was 81ys (± 2.00), 56% was female, 53% concomitantly underwent CABG, 8% had previous cardiac surgery (3% AVR and 5% CABG), 2.5% had previous PTAV, 72% had a history of hypertension, 10% had diabetes mellitus, 27% had peripheral vascular disease, 79% was still in sinus rhythm, 13% had atrial fibrillation and 8% had a pacemaker. 95% had a LVEF > 50%. Mean creatinine was 1.19 mg/dl (± 0.46), mean STS risk score on morbidity and mortality was 23% (± 8.18). Underlying valve pathology was aortic stenosis in 79%, regurgitation in 6%, mixed valvular disease in 15%. No procedure was emergent. All but 2 patients were symptomatic. Mean onset of symptoms before surgery was for angor pectoris 6 months (range 0.1-120), for syncope 4 months (range 0.25-36), for exertional dyspnea 7 months (range 0.5-60), and the mean interval between first hospitalization for pulmonary edema and surgery was 2 months (range 0.25-19). Most common perioperative morbidity was atrial fibrillation

in 43%, delirium in 43%, temporary pacing in 25%, permanent pacemaker in 7% and renal insufficiency in 24% with 8 of this 29 patients needing short-term dialysis and 1 permanent. 13% was treated for pulmonary edema, 16% for pneumonia, 7% for decubitus, 5% for myocardial infarction, 3% for sepsis and 2.9% suffered postoperative CVA. 49% of the patients deceased during follow-up, including a 30-day mortality of 11%. Kaplan-Meier survival analysis showed a long-term survival of 62% at 5 ys, 32% at 10ys and 0% at 15ys. Cause of death was cardiac in 37%, non-cardiac in 46% (most common: malignancy, infection, CVA, hip fracture) and was unknown in 17%. 56% was rehospitalised during follow-up, with mean time interval of 10 mths (range 0.75-120) after cardiac surgery, 50% for cardiac causes. After cardiac rehabilitation, 43% returned to their independent state of living, 31% returned home with external help, 12% went permanently to an institution or moved in with their family.

Conclusions. A Belgian Caucasian octogenarian has a mean life expectancy of 6.92ys for men and 8.84ys for women. The presence of symptomatic aortic valve disease reduces this to 2-3ys. We can conclude that aortic valve surgery has a better survival than the natural evolution of aortic valve disease, with acceptable morbidity. We can also conclude that even in this cohort of octogenarians with little comorbidity, the delay between onset of symptoms and surgery has still a substantial time range which might reflect the difficulty in therapeutic decision-making in these high-aged patients. As severity of symptoms and advanced age increase the risk of (post)operative morbidity and mortality and loss of function, earlier referral for surgery after onset of symptoms is warranted to further improve outcome.

Role of pulmonary hypertension and right ventricular dysfunction in aerobic exercise capacity limitation in normal volunteers at high altitude. # — Sandrine Huez², Vitalie Faoro¹, Mickael Moreels¹, Régine Bastin², Kathleen Retailleau³, Michel Lamotte², Robert Naeije¹ (¹Laboratory of Physiology, Faculty of Medicine, Free University of Brussels, Brussels, Belgium, ²Department of Cardiology, Erasme University

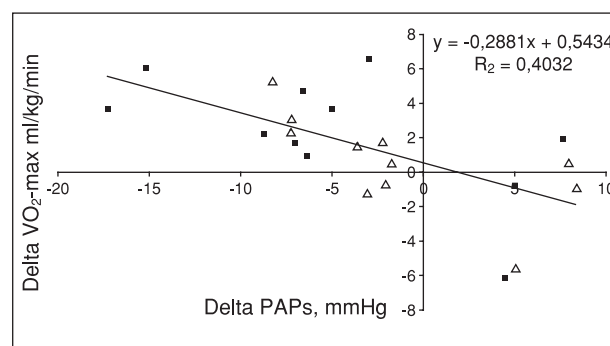
Hospital, Brussels, Belgium, ³Department of Cardiology, CHU Charleroi, Charleroi, Belgium).

Background. High altitude exposure is associated with an altered exercise capacity. We tested the hypothesis that hypoxic pulmonary vasoconstriction decreases aerobic exercise capacity because of a limitation of right ventricular (RV) flow output. Therefore, we investigated the effects of the endothelin receptor blocker sitaxsentan on high altitude-induced pulmonary hypertension, right ventricular and maximum oxygen uptake ($\text{VO}_{2\text{max}}$), compared to placebo.

Methods. Twenty-two healthy volunteers have been studied by echocardiography and during a cardiopulmonary exercise testing, at arrival (Day 0) at the Pyramid International Laboratory (5050 m, Khumbu region, Nepal) after 6 days ascension. Same measurements were repeated after 6 days of sitaxsentan 100 mg o.d. (n = 11) or placebo o.d. (n = 11) during 6 days (Day 6).

Results Baseline measurements showed no difference between the 2 groups. After 6 days, sitaxsentan improved maximal load, VO_2 max and cardiac index and decreased systolic pulmonary artery pressure (Pap). The RV Tei index decreased in the sitaxsentan group but the difference did not reach significance. TAPSE decreased in the placebo group but not in the sitaxsentan group (mean \pm SE).

Conclusions. Inhibition of hypoxic pulmonary hypertension by sitaxsentan improves exercise capacity and right ventricular function concomitantly in acclimatized subjects at high-altitude.



Changes in systolic Pap and $\text{VO}_{2\text{max}}$ were tightly correlated.

	Placebo Day 0	Placebo Day 6	Sitaxsentan Day 0	Sitaxsentan Day 6
Maximal load, W	148 \pm 12	151 \pm 13	152 \pm 10	167 \pm 13*
$\text{VO}_{2\text{max}}$, ml/min/kg	27 \pm 2	27 \pm 2	27 \pm 1	29 \pm 1*
Systolic Pap, mmHg	38 \pm 2	36 \pm 3	36 \pm 1	32 \pm 2*
Cardiac index, l/min/m	8 \pm 1	8 \pm 1	8 \pm 1	6 \pm 1**
RV Tei Index	0.36 \pm 0.05	0.36 \pm 0.09	0.32 \pm 0.04	0.21 \pm 0.04
TAPSE, mm	31 \pm 1	28 \pm 1*	28 \pm 1	29 \pm 1*

p < 0.05 compared to Day 0.

A possible association between takotsubo cardiomyopathy and treatment with flecainide. Δ — Laurence Gabriel, Patrick Chenu, Antoine Guedes, Vincent Dangoisse, Baudouin Marchandise, Dominique Blommaert, Jacques Jamart, Luc De Roy, Erwin Schroeder (*Cliniques Universitaires de Mont Godinne, Yvoir, Belgium*).

Background. Emotional or physical stress seems to be the triggering factor in Takotsubo(TKTS) cardiomyopathy. This syndrome especially affects middle-age woman and a specific predisposition to this stress cardiomyopathy is likely. The aim of our study was to detect a possible relationship between cardiac drugs and TKTS cardiomyopathy occurrence.

Methods. We reviewed retrospectively data of 12 consecutive patients (age: 64 ± 7.4 ; 10 females) with well documented TKTS diagnosed between January 2005 and December 2006.

Results. The triggering event was emotional stress for 6 patients and physical stress for 4. Four patients (33%) were treated by flecainide at the admission whereas, among 280 other patients with normal angiography during the same period, only 7 (2.5%) received this drug. Moreover, among the 280 patients of this database, none of the 36 patients with acute chest pain, normal LV function and normal coronary arteries received flecainide. Among the 4 patients with TKTS under flecainide, 2 of them developed complications (cardiogenic shock and torsades de pointe) and 3 presented recurrences.

Conclusions. We report for the first time a possible association between flecainide use and the occurrence of TKTS and its complications.

Familial mutation screening and gene expression evaluation in hypertrophic cardiomyopathy profiling: implications for a molecular diagnosis strategy. $\#$ —

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Background. Hypertrophic cardiomyopathy (HCM, OMIM 192600) is a myocardial disease described by variable clinical characteristics and different patterns of inheritance. As the scientific data indicates sarcomere gene mutations as modifier agents of cardiac contractility, a major question arises concerning phenotype-genotype correlation. One of the aims of our study

is to screen sarcomere gene mutations in the Portuguese population in order to contribute to a HCM severity database. Moreover, with the aim of establishing the genomic portrait derived from sarcomere gene mutations, we have analysed gene expression by Real-Time RT-PCR.

Methods. Genomic DNA was isolated from peripheral blood samples. Mutations were screened in the *MYH7*, *MYBC3*, *TNNI3* and *TNNT2* genes through PCR-SSCP and direct sequencing. The sarcomere gene expression was determined from RNA cardiac biopsies by Real time RT-PCR according to comparative ddCt method.

Results. For a correct understanding of the genetic phenotype associated alterations, we report the pedigree analysis of two families. In family I, the father was diagnosed with HCM and in his two sons were also denoted cardiac symptoms. A co-segregation of a *TNNI3* missense mutation and a *TNNT2* polymorphism has been verified in one of the sons. In the other son, the same polymorphism and a different *TNNI3* missense mutation has been identified; this could have been inherited from the mother, or may be a case of a *de novo* mutation. In family II, mother and son were both diagnosed with severe HCM, corroborated by a co-segregation of a *MYBPC3* missense mutation and a 5bp deletion. Interestingly, this deletion shows a heterozygote pattern in the mother and a homozygote pattern in the son, pointing out to a phenomenon of genetic mosaicism. Germline- and post-zygotic mosaicism are very rare in cardiac diseases and suspected in this family in which the son affected with a dominant disorder was born from one genetically unaffected parent. Additionally, preliminary results indicate that expression of sarcomere genes by Real Time PCR is possible and, at mRNA level, point out transcriptional differences associated with the altered DNA profiles

Conclusions. Our results highlight the HCM genetic variability, indicating, whenever possible, the importance of screening the whole family for all sarcomere genes. Furthermore, the sarcomere transcripts involved in cardiomyocyte contractility may represent valuable candidates for HCM accurate diagnosis. Our results point out to the modulation of expression possibly due to a DNA alteration. The results of these studies are clinically useful for strategies of risk stratification.

High circulating adiponectin levels predict hospital admission within 2 years in chronic heart failure patients independent of well-established and novel prognostic factors. $\#$ —

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Background. Adiponectin is an insulin-sensitizing, anti-inflammatory and anti-atherogenic adipocytokine. Low adiponectin levels confer poor prognosis in cardiovascular patients. Conversely, recent evidence suggests high adiponectin levels as an independent predictor of mortality in chronic heart failure (CHF) patients. We aimed to assess the prognostic value of circulating adiponectin concentrations, in relation with other clinical, laboratory and exercise data in CHF patients.

Methods. Sixty-three CHF patients (58.1 ± 11.5 years, 46 (73%) men, BMI 26.2 ± 4.4 kg/m², left ventricular ejection fraction [LVEF] $25.3 \pm 9.1\%$, 39 (62%) ischemic etiology) underwent clinical assessment, LVEF and cardiopulmonary exercise testing. Circulating concentrations of adiponectin, NT-pro-BNP, hsCRP, IL-6, TNF α , TNF α receptor R1 and 2, and lipoproteins were measured. After 2 years of follow-up the hazard ratio (HR) of adiponectin for heart failure related hospitalizations, mortality and heart transplantation was estimated using multivariable Cox proportional hazard regression analysis.

Results. Adiponectin levels were related to heart failure severity (8.16 mg/L ± 4.71 in NYHA I-II [$n = 22$] vs. 12.83 mg/L ± 6.73 in NYHA III-IV [$n = 41$], $p = 0.007$).

Adiponectin concentrations correlated positively with NT-pro-BNP ($r = 0.49$, $p = 0.01$), HDL ($r = 0.40$, $p = 0.01$), and negatively with BMI ($r = -0.29$, $p = 0.05$), TG ($r = -0.50$, $p = 0.01$), exercise capacity (%VO₂ peak: $r = -0.24$, $p = 0.070$), and maximal workload ($r = -0.26$, $p = 0.05$).

During follow-up, 5 (8%) patients died, 5 (8%) underwent cardiac transplantation and 23 (37%) were admitted for CHF deterioration. The unadjusted hazard for hospitalization was higher in patients with adiponectin values above the 75th percentile (16.9 mg/L) ($n = 16$) ($p = 0.03$). Adiponectin remained independently predictive (HR = 3.63, $p = 0.02$), when controlling for well-established predictors of mortality/morbidity in CHF (gender, LVEF < 25%, NYHA class, ischemic etiology, creatinine clearance). Including novel predictors (high BNP, %VO₂ peak, maximal workload, HDL, TG) did not affect the HR estimate.

Conclusions. Significantly higher circulating adiponectin concentrations were found in patients with more severe CHF. High adiponectin levels predict hospital admission within 2 years in CHF patients independent of well-established and novel prognostic factors.

Circulating adiponectin levels in patients with chronic heart failure. The effect of exercise training. * —

An Van Berendoncks, Paul Beckers, Vicky Hoymans, Nadine Possemiers, Floris Wuyts, Christiaan Vrints, Viviane Conraads (*Antwerp University Hospital, Antwerp, Belgium*).

Background. The adipocytokine adiponectin is an insulin-sensitizing, anti-inflammatory and anti-atherogenic hormone. Contrary to other studied populations, high adiponectin levels have emerged as an independent risk factor for outcome in patients with chronic heart failure (CHF). Lifestyle adaptation restores reduced adiponectin levels in patients at risk for atherosclerotic disease. Modification of adiponectin levels in CHF patients has not been studied. We assessed circulating adiponectin concentrations in CHF patients and evaluated the effects of physical training.

Methods. Circulating adiponectin concentrations were measured using ELISA in 61 CHF patients and 10 healthy subjects. The effect of 4 months exercise training on adiponectin levels was studied in 42 patients out of this group. In addition, adiponectin was assessed twice (similar time interval) in an untrained control CHF group ($n = 19$). All data (clinical assessment, fasting blood samples, echocardiography and cardiopulmonary exercise testing) were collected at baseline and after 4 months.

Results. Adiponectin levels were significantly higher in the CHF population ($n = 61$, median age 57.1 years, range 27.2 – 80.2, 64% males) compared to healthy subjects ($n = 10$, median age 55.0 years, range 38.0 – 85.0, 60% males) (11.78 mg/L ± 6.60 vs. 6.57 mg/L ± 3.45 , mean \pm SD, $p = 0.017$). Stratification of CHF patients according to tertiles of NT-pro-BNP revealed a significant increase of adiponectin with disease severity (7.50 mg/L ± 4.98 vs. 11.79 ± 5.28 vs. 15.61 ± 6.80 respectively, $p < 0.0001$).

Log adiponectin concentrations measured at baseline in all CHF patients ($n = 61$) were positively associated with log NT-pro-BNP ($r = 0.615$, $p < 0.0001$), HDL ($r = 0.476$, $p < 0.0001$) and correlated negatively with BMI ($r = -0.317$, $p = 0.013$), triglycerides ($r = -0.448$, $p < 0.0001$), exercise capacity (%VO₂ peak: $r = -0.266$, $p = 0.038$; maximal workload ($r = -0.287$, $p = 0.025$) and muscle strength ($r = -0.434$, $p = 0.001$). Stepwise multivariable analyses identified high NT-pro-BNP and HDL as independent predictors of high circulating adiponectin.

Exercise training significantly reduced circulating adiponectin levels in CHF patients (12.27 mg/L ± 6.98 before, 11.08 mg/L ± 7.33 after training), whereas no changes were observed in the untrained control CHF group (10.70 mg/L ± 5.69 before, 11.94 mg/L ± 8.84 after similar time interval; $p = 0.024$ for time \times group interaction).

Conclusions. Circulating adiponectin concentrations are significantly higher in CHF patients compared to healthy subjects and increase in relation to disease severity. A pro-atherogenic risk profile is related to lower adiponectin levels, even in the presence of CHF. Physical training lowers circulating adiponectin levels.

BELGIUM-HF (Better Efficacy in Lowering events by General practitioner's Intervention Using remote Monitoring in Heart Failure): Concept and feasibility. Δ — Steven Vercauteren¹, Marc Castadot¹, Michel Vanhalewyn², Serge Boulanger², Annie Robert³, Catherine Bouvy¹, Dirk Colpaert⁵, Sami Sbaysi⁴, Geoffrey Zanelli⁶, Jacques Col¹ (¹*Brussels Heart Centre, Brussels, Belgium*, ²*Société Scientifique de Médecine Générale, Brussels, Belgium*, ³*Epidemiology Unit (EPID), Catholic University of Louvain (UCL), Brussels, Belgium*, ⁴*Vitalsys S.A., Brussels, Belgium*, ⁵*Touring N.V., Brussels, Belgium*, ⁶*Belgacom Mobile S.A., Brussels, Belgium*).

Background. Although efficient treatment is available for heart failure (HF) due to left ventricular systolic dysfunction, delayed diagnosis of pending clinical aggravation contributes to maintain mortality and hospitalisation rates at excessively high levels. The interest in telemedicine, as a way of providing faster and more appropriate care, has been stimulated by the rising costs of hospital treatment, the rapid advances in technology, and the wider availability of low-cost, patient-friendly equipment. A very limited number of randomised trials (5) totalising 807 patients compared various clinical outcomes of telemonitored HF patients with those receiving usual care. Although a favourable trend was observed on mortality and the rate of hospitalisation, these results remain to be confirmed by more rigorously designed trials as the impact of telemonitoring vital signs on decisions for intervention has not been studied, when one should consider this as a preliminary step in assessing the clinical value of the whole strategy.

Methods. The BELGIUM-HF Registry is designed to identify predictors of clinical outcomes using non-invasive home-based telemonitoring. Signal trends based on weight, blood pressure (BP) and pulse rate, will be processed into patterns relevant to the end-point events (mortality, rehospitalisation, urgent visit with intervention). Such templates could not only provide valuable information on the physiopathology of HF recurrences, but could later automatically assist the monitoring system, trigger alarms and contribute to lower the complications of HF by early and appropriate interventions. The latter will be tested in a subsequent randomised double-blinded trial (BELGIUM-HF Trial). By involving the General Practitioner, the patient's environment for providing usual care remains unchanged. This choice was also made to relieve the cardiologist, who appeared quickly overloaded by the amount of monitoring data.

The registry is enrolling all opportunist patients fulfilling the inclusion criteria: left ventricular ejection fraction (LVEF) $\leq 40\%$, hospitalisation for HF in the last 6 months and need of loop diuretics in the last 2 weeks. The inclusion has started and patients are

completing daily blind measurements of weight, blood pressure and pulse rate during 3 to 6 months using a dedicated telemonitoring platform (VitalCare®, Vital-sys, Brussels). Results are automatically transferred through a dedicated portable phone to a central processor for storage, and are further processed for signal analysis. At the call center, a nurse is dedicated to solve technical problems, to assist the patients in training on the capture of measurements and to supervise patient's compliance.

Results. 18 patients have been included totalling 1848 telemonitoring days so far. Baseline characteristics of enrolled subjects are as follows (meanSD): age 7611 years, LVEF 308%, BNP 11451228 pg/ml and NT-proBNP 20741171 pg/ml. The compliance rate, defined as the ratio of obtained and expected measurements, is high (91% and 92% for BP/pulse rate and weight recordings respectively). 2 patients (11%) suspended telemonitoring before the expected 3 months. Need for technical interventions is low (0.08 patient/month) and consisting mostly of battery replacements. One patient is also recording parameters from abroad.

Conclusions. The BELGIUM-HF Registry is an innovating concept designed to identify predictors of clinical outcomes in patients with chronic heart failure using non-invasive home telemonitoring. Initial experience shows that it is feasible with a high rate of compliance, even in older patients, a low rate of technical interventions, and data being transmitted from abroad.

Pacing and electrophysiology

Thoracoscopic cryo-maze procedure for continuous atrial fibrillation. Δ — Filip Casselman, Peter Geelen, Frank Van Praet, Ivan Degrieck, Yvette Vermeulen, Hugo Vanermen (*OLV Clinic, Aalst, Belgium*).

Background. Our aim was to evaluate the outcome of an endoscopic endocardial cryo maze procedure in continuous atrial fibrillation (AF).

Methods. Between November 2005 and May 2008, 25 patients underwent a video-assisted endocardial cryo maze procedure for symptomatic AF or recurrence after percutaneous treatment (n = 9). There were 20 male (80%) and 5 female patients (20%) with a mean age 55.5 ± 9.5 years. Mean preoperative AF duration was 83 ± 89.5 months. Mean preoperative left atrial dimension was 44 ± 5.4 mm. Most patients had a mild degree of mitral valve regurgitation. Two patients previously underwent epicardial microwave pulmonary vein isolation ablation. The postoperative protocol included sotalol, coumadin and holter monitoring at regular intervals.

Results. All patients underwent a left atrial cryo-maze procedure and 5 also underwent a right atrial

procedure. All patients except 9 underwent an additional valve annuloplasty. No deaths occurred. One patient needed conversion to sternotomy for bleeding. All other procedures were successful. One postoperative cerebrovascular accident occurred with full recovery after 2 weeks. During follow-up (mean 12.1 ± 7.2 months, 16 pts more than 1 year) two operative reinterventions occurred: one mitral valve repair for progressive MR and one tricuspid valve repair for endocarditis. Right atrial flutter ablation occurred 4 times and DC shock for left atrial flutter once. Freedom from atrial fibrillation was 91.7% at 1 and 2 years.

Conclusions. An endoscopic video-assisted cryomaze procedure offers a highly successful approach for the surgical treatment of continuous atrial fibrillation. Hybrid therapy with catheter ablation seems warranted to treat postoperative atrial flutter.

Radiofrequency ablation of atrial fibrillation using a novel circumlinear catheter. Δ — Yves De Greef, Yves Vandekerckhove, Rene Tavernier, Mattias Duytschaever (*St Jan Hospital Bruges, Bruges, Belgium*).

Background. We examined the feasibility, efficacy and safety of catheter ablation of atrial fibrillation (AF) using a novel decapolar catheter (Pulmonary Vein Ablation Catheter, PVAC, Ablation Frontiers, Carlsbad, CA, USA). A multi-channel radiofrequency (RF) generator (GENius TM) allowed the operator to deliver pre-defined ratios of bipolar and unipolar RF energy to any or all electrodes on the catheter array.

Methods. We studied 13 patients (mean age 59 ± 8 years) referred for treatment of symptomatic and drug-refractory recurrent AF (10 paroxysmal, 3 persistent AF). Duration of AF history was 81 ± 69 months. Left atrial (LA) diameter was 40 ± 4 mm and number of previous anti-arrhythmic drugs (AADS) was 2.5 ± 1.4 . In total 52 pulmonary veins (PVs) and 2 superior caval veins (SVC) were targeted with the PVAC catheter. Duty-cycled bipolar and unipolar RF energy (4:1 or 2:1 ratio, maximum 10 W, target temperature of 60°C), was delivered at pre-selected electrode pairs during 60 seconds. Proper positioning of the PVAC catheter at the PV ostium was ensured by the use of fluoroscopy and over-the-wire technique. A conventional circular mapping catheter together with differential pacing maneuvers was used to assess presence/absence of PV potentials at the beginning and end of the procedure. PVAC dwell-time was defined as the time during which the PVAC catheter remained into the LA.

Results. Using PVAC, electrical isolation of PV's was achieved in 50/52 PVs (96%) and in 2/2 SVCs (100%). Mean number of PVAC applications was 23 ± 7 with a single application for the SVCs. The mean

number of PVAC applications was 6 ± 2 for the right superior PV (RSPV), 6 ± 3 for the right inferior PV (RIPV), 5 ± 1 for the left superior PV (LSPV) and 6 ± 3 for the left inferior PV (LIPV). Procedure time was 183 ± 42 min, fluoroscopy time was 60 ± 15 minutes (fluoroscopy dose 404 ± 196 mGy). From the 1st to the last procedure, the PVAC dwell time decreased markedly from 144 to 75 min. After a mean follow up of 54 ± 25 days no major events had occurred and 12/13 (93%) patients were free of symptoms on previously failing drugs. A redo-procedure in one patient showed PV reconnection in only 1 out of 4 PVs (LIPV) and no PV stenosis.

Conclusions. Our preliminary experience suggest that circumlinear catheter ablation with a novel decapolar catheter (PVAC) is a feasible and efficient approach to electrically isolate pulmonary veins. Early clinical results are encouraging and additional study of this device is warranted to evaluate long-term clinical outcome and persistence of PV isolation.

Unexplained syncope and atrio-ventricular nodal tachycardias (AVNRT): a not so rare finding. Δ — Olivier Deceuninck, Dominique Blommaert, Frédéric Devroey, Olivier Xhaet, Elisabeth Ballant, Fabien Dormal, Benoît Collet, Véronique Godeaux, Catherine Bertholet, Luc De Roy (*Cliniques Universitaires UCL Mont-Godinne, Yvoir, Belgium*).

Background. A substantial number of syncope do not find an adequate solution after extensive non invasive diagnostic work-up; they are classified as "syncope of unknown origin". We hypothesized that electrophysiologic testing (EPT) could add to the diagnosis and treatment of these patients (pts), especially if syncope appeared to be abrupt, repetitive and clinically worrying.

Methods. We reviewed retrospectively patients admitted for syncope of unknown origin from 01-01-2004 to 01-01-2008. We performed an EPT in 209 of these pts with a negative initial investigation during a complete work-up. During EPT we paid specific attention to the presence of dual AV nodal conduction, the presence and type of retrograde conduction and to the induction of AVNRT, if necessary with the use of isoprenaline (80% of pts) and additional atropine (10% of pts).

Results. Two-hundred nine pts (mean age 57.7 ± 19 y; 53% men) were included in this review. During programmed stimulation, AVNRT was induced in 24/209 pts (11.5%); these pts had a history of sudden syncope and no history of palpitations or paroxysmal tachycardia before EPT. There were 16/24 women (67%). The mean age was 40 ± 21 y; median: 38y. Syncope was responsible for physical injury in 54% (13/24) of these pts. A profound hypotension at induction of AVNRT

(mean of 63 ± 25 mmHg of blood pressure drop) was present in the vast majority, explaining the abrupt nature of the syncopes, without warning palpitations. Some of these pts (8/18pts) had in addition a positive tilt test: 4 a vasodepressor and 4 a mixed type, which could have add to the absence of warning symptoms before syncope. All patients underwent a successful ablation of the slow pathway and no recurrences were noted during a follow-up of 18 ± 15 months except 1 female pt who had paroxysmal atrial flutter with syncope 1 year later.

Conclusions. AV nodal tachycardias are a not so rare cause of severe abrupt syncope. This potential cause of sudden syncope has to be kept in mind, essentially in younger women. In selected patients with repetitive serious syncopes without explanation, EP testing could significantly contribute to diagnosis and effective treatment. Addition of isoprenaline and/or Atropine is sometimes essential to render AVNRT inducible.

Usefulness of ajmaline infusion during electrophysiological evaluation of syncope or palpitations. Δ — Tarik El Houari¹, Lara Dabiri¹, Dominique Blommaert¹, Olivier Deceuninck¹, Olivier Xhaet¹, Fabien Dormal¹, Elisabeth Ballant¹, José Ramos De Olival², Véronique Godeaux¹, Catherine Bertholet¹, Benoit Collet¹, Luc De Roy¹ (¹*Cliniques Universitaires UCL Mont-Godinne, Yvoir, Belgium*, ²*Rue Boltgen 21, Esch-sur-Alzette, Luxembourg*).

Background. Ajmaline is a class IA antiarrhythmic drug, most often used for unmasking a latent Brugada pattern, testing the heart conduction system or transforming atrial fibrillation into regular isthmus flutter. We studied the yield of ajmaline challenge in a population complaining of palpitations or syncope for elucidation of origin of these symptoms.

Methods. From March 2004 to April 2008, we performed ajmaline test in 605 patients (pts) complaining of palpitations or syncope without any explanation. After a complete diagnostic work-up, these pts underwent a complete electrophysiological (EP) testing including infusion of ajmaline, administered intravenously up to 1 mg/kg.

Results. Among these 605 patients, 268 had a sustained atrial fibrillation induced during evaluation of atrial vulnerability. Ajmaline infusion for conversion into sinus rhythm transformed atrial fibrillation into a regular isthmus atrial flutter in 114 of them (42.5%), orienting towards a potential treatment target. In 47 out of these 605 pts (7.7%), ajmaline revealed unsuspected infra-nodal conduction disturbances. In addition, ajmaline challenge unmasked a type 1 Brugada ECG pattern in 9 pts corresponding to a prevalence of 1.5%. To analyze the specific prevalence of induced

Brugada pattern in these pts, two different groups were considered:

- A first group consisting of a loco-regional population referred to our institution: 514 pts, mean age 56 ± 17 years (67% males), we found 4 positive tests with a type 1 Brugada pattern recorded in the 4th intercostal space (ICS), which corresponds to a prevalence of 0.7%.
- A second group of a Portuguese community living in Luxemburg: 91 pts, mean age 44 ± 12 years (50% males), with 5 positive tests in the 4th ICS, which means a much higher prevalence of type 1 Brugada ECG with 5.5%.

Conclusions. Ajmaline can transform atrial fibrillation into isthmus atrial flutter in about half of the pts leading to a probable explanation of the symptoms. In a proportion of pts, it may reveal unsuspected infra-nodal conduction disturbances explaining the symptoms. Ajmaline induced Brugada pattern seems to be relatively low in our loco-regional population contributing only little to the diagnosis. However, in specific communities like the Portuguese one, the prevalence is clearly higher and questions about a genetic distribution.

Non-pharmacological therapy for paroxysmal and chronic lone atrial fibrillation: Percutaneous and surgical treatment results. Δ — Peter Geelen, Filip Casselman, Peter Peytchev, Benjamin Gal, Conor McCann, Peter Goethals, David Verhelst, Kathleen Rooselaers (*Atrial Fibrillation Clinic, Cardiovascular Center, OLV Ziekenhuis, Aalst, Belgium*).

Background. Several non-pharmacological treatment options are available in patients (pts) with drug refractory lone atrial fibrillation (AF). Non-pharmacological therapy for paroxysmal AF mostly consists of percutaneous ablation in the left atrium aiming at isolation of the pulmonary veins with or without additional ablation lines in the left atrium

Methods. A retrospective analysis of the results of wide area circumferential ablation of the pulmonary veins (PV) using electroanatomic mapping in 196 patients (36 female, 160 male, mean age 49.1 yrs) with medically refractory paroxysmal AF. Regular follow-up including long-term rhythm monitoring was performed in all pts. Kaplan Meier survival analysis was performed to calculate survival free of AF. A blanking period of two months after the procedures was used.

Results. In all 196 pts wide area circumferential ablation around the pulmonary veins (PV) was performed until isolation of all PV was achieved as assessed by absence of PV potentials within the ablation circles during electroanatomical remap or by using

a circular multipolar mapping catheter positioned within the PV. Procedure duration was 155 ± 24 minutes. Post procedure protocol consisted of systemic anticoagulation during 3 months and continuation of previously ineffective antiarrhythmic drugs during 3 months after which medication was stopped. After 136 months of follow-up, 82% of pts were free of AF. In two pts periprocedural tamponade occurred, necessitating pericardiocentesis, and one patient suffered a cerebrovascular accident 24 hours after the procedure with complete recovery. No other serious complications were seen. Four pts developed incessant left atrial flutter during follow-up which was treated with radiofrequency ablation.

Conclusion. Percutaneous wide area circumferential ablation of the pulmonary veins is a safe and effective treatment for paroxysmal lone atrial fibrillation.

Long-term follow-up of idiopathic ventricular fibrillation ablation: a multi-centre study. #

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Background. Some studies have shown promising results of catheter ablation of idiopathic VF targeting the trigger initiating the arrhythmia; however the long-term outcome of VF ablation is still unknown. This multi-centre study sought to evaluate the long term follow-up of patients with idiopathic VF.

Methods. From January 2000, 33 consecutive patients from 5 different centres underwent attempted ablation of primary idiopathic VF with short coupling ventricular premature beats. All patients had had at least one significant event (either syncope, aborted sudden cardiac death, electrical storm) and documented VF at 12-lead ECG. An initial sharp potential preceding by ≤ 15 ms the larger and slower ventricular electrogram during sinus rhythm represented a peripheral Purkinje component. During ventricular premature beat (VPB), the persistence of this Purkinje potential at the site of earliest activation indicated the Purkinje system as the origin of the VPB. In cases where VPB were absent at the time of the ablation procedure, pace mapping was used to reproduce the clinical VPB.

Results. There were 33 patients (17 men) aged 41 ± 13 years, refractory to a median 2 antiarrhythmic

drugs (including Beta-blockers and verapamil). The origin of clinical ectopy triggering VF was localized in the right Purkinje system in 13 patients, the left Purkinje in 12 patients, in both the left and right Purkinje system in 3 patients and in the myocardium in 5 patients, including the RVOT in 4 patients. During a median follow up of 60 months, only 6/33 patients (18%) experienced VF recurrence, after a median of 4 months. Four of these 6 patients were re-ablated, without VF recurrence. The only parameter associated with VF recurrence was the occurrence of bundle branch block in the ventricle of interest (mechanical bumping of the bundle) ($P < 0.0001$). The number of significant events (confirmed VF/VT or sudden death) before ablation was significantly reduced following ablation (4 (IQ range 2 to 8) vs. 0 (total range 0 to 4, $p = 0.01$).

Conclusions. Ablation of idiopathic VF associated with short coupling ventricular premature beats initiating the arrhythmia is feasible with persistence of the long term good results.

Prevalence of preoperative arrhythmias in children with severe lately diagnosed congenital heart disease.

Δ — Martial Massin (HUDERF - ULB, Brussels, Belgium).

Background. Cardiac arrhythmias in children with congenital heart disease (CHD) are not uncommon but available information focused on patients with specific cardiac lesions and on postoperative patients. The population arriving from unindustrialized countries offers us the unique opportunity to analyze the incidence of arrhythmias in children with severe structural and functional abnormalities.

Methods. 151 consecutive pediatric patients with unoperated and lately diagnosed CHD, who were in stable condition and were hospitalized in our unit in 2007 and 2008 to undergo cardiac surgery, were prospectively studied for the occurrence of cardiac arrhythmias. They all had standard 12-lead ECG, 24-hour Holter recording and continuous ECG monitoring with memory function before any invasive investigation or surgical procedure was performed. The recorded data were compared to normal rhythm patterns in 112 hospitalized noncardiac children.

Results. All the children were in sinus rhythm on their standard ECG. Moderate supraventricular extrasystoly ($n = 44$) and ventricular extrasystoly ($n = 27$) were common in cardiac children but their incidence was similar in noncardiac patients. Ventricular tachyarrhythmias were not noted. One child with L-transposition of the great arteries and large ventricular septal defect had an intermittent complete atrioventricular block. One 5-year-old child with a large ventricular septal defect had a previously unknown

long QT syndrome (Timothy syndrome). Children with severe ventricular dysfunction and dilation had paroxysmal atrioventricular reentry tachycardias in 3 cases (truncus arteriosus communis, aortic stenosis and aortic coarctation) and abnormally frequent ventricular extrasystoles in 3 cases (univentricular heart, atrioventricular septal defect, muscular ventricular septal defect). Children with severe left atrial dilation had periods of atrial ectopic tachycardia in one case (aortic stenosis with severe mitral regurgitation) and atrial fibrillation in another one (L-transposition of the great arteries with severe tricuspid regurgitation).

Conclusions. Cardiac children with severe functional abnormalities are at risk of developing significant arrhythmias. In studies on postoperative arrhythmias, a preoperative assessment should be performed before incriminating surgery. Preoperative assessment of arrhythmias in high-risk patients allows the cardiologist to prevent recurrence in the early postoperative period by beginning antiarrhythmic therapy in the preoperative phase.

Early postoperative rhythm and conduction disorders in children with lately diagnosed severe congenital heart disease. Δ — Martial Massin (*HUDERF - ULB, Brussels, Belgium*).

Background. Arrhythmias are not uncommon in children during the cardiac surgery recovery period. Our aim was to analyze the incidence of early postoperative arrhythmias in children who undergo open-heart surgery for delayed treatment of complex congenital heart disease.

Methods. 128 consecutive children arriving from unindustrialized countries with unoperated and lately diagnosed CHD were prospectively studied for the occurrence of postoperative rhythm and conduction disorders. They all had preoperative and postoperative standard 12-lead ECG, 24-hour Holter recording and continuous ECG monitoring with memory function.

Results. Rhythm or conduction disorders occurred in 113 of 128 patients. Sinus node dysfunction was noted in 4 cases (3 after Senning procedure). Preoperative moderate extrasystole was common and its incidence increased in the postoperative phase (pre- and postoperative supraventricular extrasystole respectively $n = 23$ and $n = 77$, pre- and postoperative ventricular extrasystole respectively $n = 16$ and $n = 41$). Overall, 12 patients required specific antiarrhythmic therapy: 9 for sustained atrioventricular reciprocating tachycardia (3 had experienced preoperative episodes), one for perioperative atrial fibrillation, one for postoperative monomorphic ventricular tachycardia and one for junctional ectopic tachycardia. Nonsustained atrioventricular reciprocating tachycardia required no therapy in two children. One child had a prolonged QT

(Timothy syndrome) without arrhythmias. Postoperative atrioventricular block was observed in 7 patients. It remained permanent in 3 children and intermittent in another one. Twenty-eight children had acquired a right bundle branch block. No major complications resulting from arrhythmias occurred during the postoperative clinical course.

Conclusions. Cardiac children with delayed recognition and treatment of complex congenital heart diseases are at high risk of developing significant postoperative rhythm and conduction disorders. Rhythmologists should always be included in the medical staff that cares for them during the postoperative phase.

Ablation of atrioventricular nodal reentrant tachycardia: analysis of retrograde conduction and tachycardia type. Results from the ATAV Study (Atrioventricular nodal reentrant Tachycardia and Atrial Vulnerability Study). # — Philippe Purnode², Peter Goethals², Dominique Blommaert¹, Elisabeth Ballant¹, Benoît Collet¹, Catherine Bertholet¹, Fabien Dormal¹, Olivier Deceuninck¹, Olivier Xhaet¹, Luc De Roy¹ (¹*Cliniques Universitaires UCL Mont-Godinne, Yvoir, Belgium*, ²*Brussels Heart Center - Clinique St-Jean, Bruxelles, Belgium*).

Background. Slow pathway ablation remains difficult in some atrioventricular nodal reentrant tachycardias (AVNRT) essentially due to anatomic problems but sometimes for unknown reasons. Data from the ATAV study were reviewed for analysis of ablation difficulties in relation with the type of AVNRT and the type of retrograde conduction during right ventricular pacing. Ablation was considered difficult if we had to perform more than 10 radiofrequency applications in order to ablate or modify the slow pathway.

Methods and Results. In 2 EP centers (1-2) between October 2006 and February 2008, out of 81 consecutive patients (pts) (mean age 46 ± 15 years, 75% women) 72 pts (89%) had inducible AVNRT and 9 pts (11%) had documented supraventricular tachycardias with atrioventricular nodal dual physiology and several consecutive echo beats. An electrophysiological study was performed in all these patients. In fifty-two (64%) out of the 81 patients we demonstrated the presence of one or several slow pathways and in the remaining patients (34%) no significant AV nodal dual conduction. The total number of tachycardias was 88: 57 slow/fast AVNRT (65%), 19 slow/slow (22%), and 5 fast/slow (6%). These numbers include 5 pts in which more than 1 type of AVNRT could be induced. In addition, in 7 pts (8%), the precise type of AVNRT (S/F, F/S or S/S) could not be ascertained. Out of the 81 pts, 42 had a retrograde conduction through a fast pathway, 10 had

a slow pathway and 19 had a combined retrograde fast and slow conduction. In 10 patients the type of retrograde conduction was unclear. In 49 patients (60%), slow pathway ablation was considered easy (< 10 burns) with a total energy of 6156.23 Joules, a mean ablation duration of 177.83 seconds, a mean total procedure duration of 141.86 minutes and a mean fluoroscopy time of 19.85 minutes. In 26 patients (32%) ablation was considered difficult (> 10 applications) with a total energy of 14991.75 Joules, a mean ablation duration of 387.56 seconds, a mean total procedure duration of 163.16 minutes and a mean fluoroscopy time of 29 minutes. For 6 patients the data were incomplete. In the easy ablation group (49 pts), 25 (52%) had a fast retrograde pathway, 13 (26%) a combined fast and slow retrograde conduction, 6 (12%) had a retrograde slow pathway, and in 5 (10%) it was uncertain. Likewise 36 pts (73%) had slow/fast AVNRT, 9 (18%) slow/slow AVNRT, 1 (2%) fast/slow AVNRT, 3 (6%) combined AVNRT or uncertain AVNRT. In the difficult ablation group (26 pts), 15 (58%) had a fast retrograde pathway, 5 (19%) a combined fast and slow retrograde conduction, 3 (11,5%) had slow retrograde conduction and in 3 (11,5%) it was uncertain. In the same group 14 pts (53%) had slow/fast AVNRT, 6 (23%) slow/slow AVNRT, 6 (23%) combined AVNRT or uncertain AVNRT. In the latter group there was no fast/slow AVNRT. We found no significant difference between the two groups of ablation concerning the type of AVNRT and retrograde conduction pattern. All patients were successfully ablated.

Conclusions. AVNRT may exhibit different types of antegrade and retrograde conduction. Difficulties encountered during slow pathway ablation in AVNRT seem not to be related to a particular type of tachycardia or retrograde conduction. Analysis of retrograde conduction during RV pacing is a valuable means to predict the type of AVNRT.

Tilt training therapy in pacemaker patients with neurally mediated syncope. Δ — Tony Reybrouck, Hein Heidebüchel, Rik Willems, Hugo Ector (*University Hospitals Leuven, Dept. of Cardiology and Cardiovascular Rehabilitation, Leuven, Belgium*).

Background. In patients with neurally mediated syncope (NMS), pacing has been used to prevent bradycardia and syncope. However a considerable number of patients still have syncope recurrence, due to the vasodepressor component. In our department tilt training is used as a first line therapy for NMS to condition the cardiovascular orthostatic reflex balance. The purpose of this study was to assess whether the addition of tilt training in patients with NMS after pacemaker implantation will improve the clinical outcome.

Methods. From a total group of 466 patients with recurrent NMS, a PM was implanted in 7 patients before the start of the tilt training or during the clinical follow-up. In 2 patients PM was implanted for SSS, in 3 patients for asystole and in 2 patients for NMS. These patients underwent tilt training. The Westminster protocol was used without pharmacological provocation. Patients were submitted to daily tilt testing until syncope or during a maximum of 45 min (= normal value). Patients started the tilt training in the hospital and were instructed to continue this therapy at home. The efficacy of tilt training was assessed by the first negative tilt test.

In all patients syncope disappeared during tilt training and during daily life. The time to reach a negative tilt test required slightly more (3.6 ± 2.1) sessions than the values previously obtained in patients with NMS without pacemaker (2.9 ± 1.3 , Ector et al., 2005).

Conclusions. The association of tilt training in pacemaker patients with NMS improves the clinical outcome by restoring the vasoconstrictor reserve capacity.

Results.

Patient	Gender	Age	Indication	Type S	PM type	Duration diagn TT	Duration final TT	N° first negat TT
1	M	40	SSS	VD	DDD-R	3	45	8
2	M	48	SSS	MX	VVI	16	45	4
3	F	20	NMS	VD	DDD	7	45	3
4	M	69	Asystole	VD	DDD	7	45	3
5	M	46	Asystole	MX	DDD	26	45	2
6	M	57	Asystole	CI	DDD	26	45	2
7	F	20	NMS	VD	DDD	7	45	3

NMS = syncope; SSS = sick sinus syndrome; VD = vasodepressor, MX = mixed type, CI = cardio-inhibitory type; TT = tilt test, duration tilt test = minutes.

Slow pathway bumping during cryoablation of atrioventricular nodal reentrant tachycardia: an underestimated but important phenomenon. $\#$ — Thierry Verbeet, José Castro, Sébastien Knecht, Gilles Ron-

dia, Martial Massin, Marielle Morissens, Gabriela Flores Vivian, Pierre Decoodt (¹CHU Brugmann, Brussels, Belgium, ²Children University Hospital, Brussels, Belgium).

Background. The risk of slow pathway (SP) radiofrequency ablation (RFA) in the setting of atrioventricular nodal reentrant tachycardia (AVNRT) is low (0.8%-2%) but is a complication leading to life-long disease. The effect of RFA is rapidly irreversible. Cryotherapy (CRYO) is a more recent and no incidence of persistent AV block has been described.

Methods. Between 2005 and 2008, 68 patients (PAT) were treated for AVNRT with CRYO. The age was 43.2 +/- 21.6, range 8-80 years old. 11 PAT were aged 15 or less. CRYO was attempted in all. 60 PAT had typical slow-fast AVNRT. 2 had fast-slow, 2 slow-slow and 4 both forms. 63 PAT has slow pathway (SP) ablation, 1 had fast pathway ablation. All PAT were treated with a Cryocath Freezor Extra 7F 6 mm catheter. Tachycardia induction and cryomapping of the SP at -30°C was attempted in all PAT starting on the tricuspid annulus (TA) after SP EGM mapping. If SP blocked at -30°C a full 4 min. application at -80°C was done (47 PAT, 69.1%). This lesion was enlarged if there remained more than 2 echoes. If case no sustained AVNRT could be induced an ablation line was drawn between the TA and the coronary sinus. In one case cryomapping was done during sustained antero-grade SP conduction during atrial pacing. A sustained tachycardia was not inducible in 4 PAT.

Results. In 14 PAT (22.2%) a sustained AVNRT was inducible but sustained conduction along the SP disappeared after simple CRYOCATH catheter manipulation (BUMPING) during mapping. In one child this even produced short lasting complete AV block. In these cases either a full application was done at the side of bumping or an ablation line was drawn. Rapidly completely reversible impairment of AV conduction (from slight AV delay prolongation to third degree AV block) occurred in 10 PAT (15.6%). 70.1% of the population had one or two residual echoes (with or without Isu) present at the end. AVNRT recurred in 2 patient (2.9%) both having had SP BUMPING.

Conclusions. CRYO was very effective and not associated with persistent impairment of AV conduction in this population. It allowed functional mapping and ablation with the same catheter. BUMPING of the SP occurred in a high % of cases: 22.2%. This can be due either to the stiffness of the catheter or to the fact that SP conduction has to remain unimpaired during the whole mapping process which is not the case with RF. So, SP bumping might explain why AVNRT may at times be very difficult to induce during the baseline study. This emphasizes the need to perform cryoablation of AVNRT in tachycardia rather than is sinus rhythm.

Olivier Deceuninck, Benoît Collet, Fabien Dormal, Elisabeth Ballant, Mark La Meir, Luc De Roy (*Cliniques Universitaires UCL Mont-Godinne, Yvoir, Belgium*).

Background. The effect of vagal stimulation on AV nodal conduction is well known. But the precise anatomical and functional innervation pathways from the vagus nerve, on the AV node remains poorly described. The aim of this study was to identify the role on AV nodal conduction of left atrial ganglionated plexi (GP) and the vagus nerve by testing the effect of high frequency stimulation (HFS).

Methods. Twenty two patients (pts), with persistent refractory AF underwent isolation of the LA posterior atrial wall by a right monolateral thoracoscopic epicardial PV isolation using microwave energy or radiofrequency energy. We tested the influence of HFS (20 Hz, 2 ms, 20 mA) on the right anterior GP (RAGP), right inferior GP (RIGP) and left superior GP (LSGP), analyzing AV node conduction behavior during atrial fibrillation, before and after isolation and/or dissection of these ganglia. Direct HFS of the right vagus nerve was also performed in 16 of these patients. A reduction of the ventricular rate > 50% during 5 s or ventricular asystole > 3 s was considered as significant.

Results. A significant response to HFS of the GP could be obtained in the 22 pts before isolation: for the 3 tested GP in 8 patients (36%), for 2 GP in 6 patients, and for 1 GP in 7 patients (32%). In 12 of the 16 tested patients, HFS of the vagus nerve elicited also a significant response on AV node conduction. After LA posterior wall isolation and dissection of the GP, no significant response by HFS, both of the vagus nerve or the GP, could be demonstrated in any patient. This confirmed complete isolation of the GP from the AV node and also the abolition of any connection between the vagus nerve and the AV node. This demonstrates an obligatory pathway linking the vagus nerve and the GP towards the AV node.

Conclusions. These results indicate that epicardial GP are fully isolated or dissected during epicardial approach for AF ablation. The abolishment of any right vagal influence on the AV node suggests, for the first time in humans, that the integrity of epicardial ganglionated plexi is essential to maintain the influence of the right vagus nerve on AV nodal conduction.

Cardiovascular prevention and rehabilitation

First demonstration in humans that the integrity of epicardial ganglionated plexi is requested to achieve right vagus innervation of the AV node. Δ — Olivier Xhaet, Mariana Floria, Dominique Blommaert,

Effect of a tailored behaviour change programme in highly educated adults: a randomised clinical trial. # — Nele Jacobs, Neree Claes, Herbert Thijs, Paul Dendale, Ilse De Bourdeaudhuij (¹Hasselt University, Faculty of Medicine and Faculty of Applied

Economics, Diepenbeek, Belgium, ²Hasselt University, CENSTAT, Diepenbeek, Belgium, ³Virga Jesse Hospital, Cardiology, Hasselt, Belgium, ⁴Ghent University, Department of Movement and Sports Sciences, Ghent, Belgium).

Background. Little is known about the effectiveness and the adequate intervention dose of multi-component behaviour change programmes. The aims of our study were to examine the effects of a tailored behaviour change programme and the dose-response effect on behaviour (diet, physical activity, smoking) in a highly educated study sample.

Methods. The participants were allocated at random using a 2/3 ratio to an intensive intervention group (IIG) (n = 208) and a minimal intervention group (MIG) (n = 106). The IIG was offered a tailored behaviour change programme with a personalised website, individual coaching (IC) by e-mail, telephone or face-to-face. Physical activity (PA) levels, dietary and smoking behaviour were reported at baseline and at 6 months. Repeated measured analyses of variances were used to examine differences between the two groups. Linear modelling was used to examine the dose-response effects.

Results. Both groups significantly improved in 6 months with regard to dietary behaviour but not for PA and smoking. No significant differences between the study groups were found for diet, PA and smoking. A significant dose-response effect for diet was found ($p < .05$). The most effective strategy to change dietary behaviour was a combination of frequent IC by telephone and face-to-face ($p < .05$).

Conclusions. No differences were found between the MIG and the IIG, however, significant dose-response effects were found in the IIG.

Temporal changes (1985-2004) in primary and secondary prevention before PCI.

— Laurence Gabriel, Jacques Jamart, Patrick Chenu, Vincent Dangoisse, Antoine Guedes, A. Muller, Baudouin Marchandise, G. Perot, Erwin Schroeder (*University Hospital of Mont-Godinne, Mont-Godinne, Belgium*).

Background. Our aim was to assess the changes of the prevalence of CV risk factors and their management before coronary angioplasty.

Methods. Clinical and demographic data of patients undergoing PCI at our centre during a 20-year period (1.1.1985-31.12.2004). We selected 8554 patients of age 35-74 (similarly to the ongoing WHO-MONICA BELLUX registry). Patients with a history of previous MI, PCI, CABG, CVD and PVD were considered as candidates for secondary prevention (n = 5156). The resting cohort was considered as possible candidates for primary prevention (n = 3398). Data were analyzed according to gender, to age (5-y cohorts: 35-39 y, 40-44 y ...) and to the period of PCI (5-y periods: 1985-89, 1990-94 ...).

Results. As the prevalence of most CV risk factors is age-related and the number of elderly undergoing PCI increased over time (mean age at the time of PCI increased by 3 years over the 20-y period), we analyzed the temporal changes of CV risk factors per age cohort (5 y).

Among those 3398 patients eligible for primary prevention, 543 (15.9%) underwent PCI in both settings (primary and secondary prevention). The mean interval between the 2 PCI procedures was 2.6 ± 3.7 years.

At the time of the second PCI procedure, the prevalence of active smoking decreased (from 33 to 24%, $p < 0.01$), hypolipemic treatment increased (from 15 to 31%, $p < 0.001$) and antihypertensive treatment increased (from 48 to 52%, $p < 0.001$), whereas CT and LDL levels fell (CT 238 \rightarrow 222 mg%, LDL 164 \rightarrow 132 mg%, $p < 0.001$), but not yet at the recommended levels.

Conclusions. Marked changes of the preventive therapeutic approach in routine clinical practice have occurred during the 20-year period (1985-2004). This may at least partially explain the increased prevalence of diabetes and HTN. Hypolipemic treatment has induced a marked decrease of lipid levels. In contrast to these changes, only a third of the patients (needing a second PCI) were able to abstain from tobacco after a first PCI. Active smoking remains a disturbing issue and calls for further actions, both in the setting of primary and secondary prevention.

Prevalence CV risk factors and prevention situations (men, age 60-64 y)

CV risk factor	Overall prevention		Primary prevention		Secondary prevention	
	85-90	2000-04	85-90	2000-04	85-90	2000-04
n	122	443	59	180	68	264
Active smoking (%)	24	27	20	25	27	28
Diabetes (%)	12	21*	14	18*	11	19*
HTN (%)	19	46*	27	43*	11	44*
Hypolipemic (%)	4	34*	2	33*	6	31*
[CT] (mg%)	257	205*	258	218*	256	204*
[LDL] (mg%)	173	116*	180	138*	165	114*

* 85-90 vs. 00-04: $p < 0.01$

The acute effect of exercise on endothelial progenitor cells in chronic heart failure. *

— Emeline Van Craenenbroeck¹, Paul Beckers¹, Geert Frederix¹, Nadine Possemiers¹, Bernard Paelinck¹, Vicky Hoymans¹, Johan Roeykens², Kurt Wuyts¹, Christiaan Vrints¹, Viviane Conraads¹ (¹*Department of Cardiology, Antwerp University Hospital, Edegem, Belgium*, ²*S.P.O.R.T.S., Antwerp University Hospital, Edegem, Belgium*).

Background. Endothelial dysfunction is an important determinant of exercise intolerance in chronic heart failure (CHF). Exercise training partially restores vascular reactivity and physical capacity in CHF patients. Training-induced mobilization of endothelial progenitor cells (EPC) and their associated regenerative capacity might explain these observed benefits. Exercise acutely increases the number of circulating EPC in healthy subjects, however, similar studies in CHF patients are lacking. The aim of the present study is to assess the effect of a cardio-pulmonary exercise test (CPET) on EPC numbers and their migratory capacity in sedentary CHF patients.

Methods. Endothelial function was assessed by ultrasound of the brachial artery (flow mediated dilation, FMD) in 42 sedentary CHF patients. Twenty one patients were classified as mild CHF (NT-proBNP < 800 pg/ml, LVEF 32 ± 1%, 58 ± 2 yrs, FMD 5.8 ± 0.5%, mean ± SEM) and 21 as severe CHF (NT-proBNP > 800 pg/ml, LVEF 26 ± 1%, 65 ± 2 yrs, FMD 5.8 ± 0.6%). Circulating CD34⁺ and CD34⁺/KDR⁺ cells (EPC) were determined by flow cytometry before and 10 minutes after CPET. Migration towards VEGF and SDF-1 α was assessed at day 7 of EPC culture (acLDL⁺/UEA-1⁺ cells) and EPC senescence was detected by acidic β -galactosidase positivity. Additionally, 8 age-matched patients with documented coronary artery disease (CAD) (LVEF 52 ± 1%, 67% males, 59 ± 3 yrs, FMD 3.4 ± 0.5%) were enrolled and 10 age-matched healthy subjects (54 ± 1 yrs, FMD 6.8 ± 0.4%) without cardiac history and normal cardiac examination served as controls.

Results. Compared to healthy subjects, CAD and CHF patients exhibit an impaired endothelial vasodilation ($p = 0.013$), which was correlated to VO_{2peak} ($r = 0.248$, $p = 0.05$). Prior to CPET, migratory capacity of EPC was significantly decreased in CAD patients (46.3 ± 4.6%), mild CHF patients (39.6 ± 3.0%) and severe CHF patients (31.3 ± 3.5%) when compared to healthy subjects (61.0 ± 5.6%, all $p < 0.05$). Migratory function of EPC was correlated positively to VO_{2peak} ($r = 0.682$, $p = 0.021$). EPC senescence was significantly reduced in CAD patients (36.8 ± 7.8%), mild CHF patients (44.0 ± 4.6%) and severe CHF patients (44.2 ± 5.4%) in comparison to healthy subjects (77.8 ± 3.5%, all $p < 0.05$). CD34⁺ and CD34⁺/KDR⁺ cell numbers were not different between the 4 groups.

Following exercise, migratory capacity improved acutely in mild CHF patients (39.6 ± 3.0% vs. 48.2 ± 3.3%, $p = 0.021$) and severe CHF patients (31.3 ± 3.5% vs. 48.6 ± 3.9%, $p = 0.001$), but a significant improvement was absent in CAD patients (46.3 ± 4.6% vs. 53.1 ± 7.7%, $p = 0.4$) or healthy subjects (61.0 ± 5.6% vs. 61.0 ± 5.6%, $p = 0.2$). Exercise had no effect on circulating CD34⁺ or CD34⁺/KDR⁺ numbers in CHF patients.

Conclusions. CHF patients exhibit impaired migratory function in EPC which is correlated to disease severity and exercise capacity. Acute exercise improved migratory activity of early EPC, whereas circulating number remained unaltered. The observed increase was larger in advanced disease stages. This finding may explain the beneficial effect of exercise training on endothelial function. Interestingly, in clinical practice, assessment of the functional capacity of EPC could become a useful biologic marker for vascular function to monitor the intended effect of physical training on endothelium-dependent vasodilation.

Prognostic value of the oxygen uptake efficiency slope in patients with coronary artery disease and intermediate peakVO₂.

— Nico Van de Veire², Christophe Van Laethem¹, Marc De Buyzere¹, Johan De Sutter³ (¹*Ghent University, Ghent, Belgium*, ²*Leiden University Medical Center, Leiden, Netherlands*, ³*AZ Maria Middelaers, Ghent, Belgium*).

Background. Peak exercise oxygen uptake (peakVO₂) is a widely used prognosticator. Recently, a novel spirometric parameter, less affected by submaximal performance, the oxygen uptake efficiency slope (OUES) has been introduced. The present study evaluated the potential discriminative prognostic value of OUES in patients with coronary artery disease (CAD) and intermediate peakVO₂.

Methods. Bicycle spiroergometry was applied in 214 patients with CAD. At baseline, New York Heart Association (NYHA) class, 6 minutes walking distance, N-terminal pro-Brain Natriuretic Peptide (NT-proBNP), left ventricular (LV) volumes and ejection fraction were evaluated. Patients were followed for the combined endpoint of cardiovascular death, non fatal myocardial infarction, myocardial revascularization (CABG/PCI) or hospitalization for heart failure.

Results. Mean age of the patients was 67 ± 8 years (85% men), mean NYHA 1.4 ± 0.6 (range 1-3), mean LVEF 55 ± 14%, mean OUES/kg was 18.1. OUES was strongly related to peakVO₂ ($r = 0.79$). Patients with intermediate peakVO₂ (12-18 ml/kg/min) and low OUES/kg (median value < 15.3) had higher NYHA class, lower walking distance, higher NT-proBNP levels and higher LV volumes as compared to patients with a similar peakVO₂ but high OUES/kg levels.

After a median follow-up of 3 years, patients with peakVO₂ < 12 ml/kg/min, intermediate peak VO₂ and OUES/kg < 15.3, intermediate peakVO₂ and OUES/kg > 15.3, peakVO₂ > 18 ml/kg/min had event rates of respectively 36%, 26%, 15% and 14% (Log rank 7.92, P < 0.05).

Conclusions. In patients with stable CAD and an intermediate peakVO₂, OUES provides additional prognostic information.

Normal values for interbreath variability during exercise:

a new parameter for clinical exercise testing. Δ —

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Background. During exercise, the variability in gas exchange parameters has been reported to increase in some patients with severely depressed left ventricular function. As normal values for interbreath variability have not been reported yet, the aim of the present study was to develop reference values obtained from clinically healthy children and adolescents.

Methods. We examined 78 children varying in age from 5 to 19 years. Variability in oxygen uptake (VO₂) was defined as the mean value for the differences between the VO₂ of all single breaths during one minute and the mean of all these breaths during the same time interval. These differences were expressed as a percentage of the mean VO₂ during that minute.

Results. In the healthy children, the variability in VO₂ was not significantly influenced by anthropometrical characteristics. During graded exercise, a significant decrease in variability (p < 0.001) in VO₂ was found with increasing exercise intensity.

Conclusions. These data provide normal values for the variability in parameters of gas exchange that can be used for cardiovascular exercise testing in children and adolescents and offer extra information.

Adult congenital heart disease

Catheter ablation of post-senning atrial tachycardia using CT-guided electro-anatomical mapping. Δ —

Julie De Backer, Dan Devos, Laurent Demulier,

Mattias Duytschaever (*University Hospital Ghent, Ghent, Belgium*).

Background. Until the mid 80's, patients born with d-transposition of the great arteries underwent atrial inversion procedures, redirecting systemic venous return to the left ventricle and pulmonary venous return to the right ventricle. These operations fell into disfavor in part owing to a high incidence of atrial tachycardia (AT) at long-term follow-up (2 to 10% of patients at 4 to 10 year follow-up). The associated morbidity and mortality has prompted an aggressive treatment strategy. We describe the procedure and outcome in 2 patients late after Senning procedure undergoing radiofrequency (RF) ablation for atrial tachycardia (AT).

Methods and Results. Two patients (male, 21 and 37 yrs) presented with recurrent and symptomatic AT with rapid ventricular response despite optimal medical treatment. The ECG showed a flutter with an atrial cycle length of 280 ms with 2:1 atrioventricular conduction. Prior to the ablation procedure, a transesophageal echocardiography was performed to exclude baffle obstruction. A 3-dimensional bi-atrial model was made from a pre-acquired contrast-enhanced CT dataset. The procedure was performed using the Carto Merge electro-anatomical mapping system. During AT, activation maps were reconstructed of the systemic venous atrium (SVA) (via the inferior caval vein) and of the pulmonary venous atrium (PVA) (via the aorta in a retrograde fashion). In both patients mapping revealed a counter-clockwise reentrant tachycardia around the tricuspid annulus (TA) with an isthmus that spans the floor of the PVA and also the adjacent region inside the baffle. Multiple radiofrequency applications were delivered to the floor of the PVA near the TA and the floor of the baffle in an area adjacent to the TA isthmus and the PVA. This resulted in termination and non-inducibility of AT in one patient. The flutter could not be terminated in the other patient, where the procedure was complicated by extensive thrombosis of the inferior caval vein.

Conclusions. Catheter ablation for atrial flutter in patients late after Senning correction for transposition of the great arteries is feasible and requires multimodality imaging.

Overall success rates should be assessed in a larger group of patients and stringent anti-thrombotic regimens should be applied in each patient.

Catheter ablation for arrhythmias in congenital heart disease: a single centre experience. # —

Marielle Morissens¹, Thierry Verbeet¹, José Castro Rodriguez¹, Gilles Rondia², Hugues Dessy², Pierre Viart² (¹CHU-Brugmann, Brussels, Belgium, ²HUDERF, Brussels, Belgium).

Background. Arrhythmias are the most frequent late complications observed in adults with congenital heart disease. The rate of success of catheter ablation procedures in this population is often low, due to complex anatomy and the presence of multiple scars. The aim of this work is to assess the rate of success of catheter ablation in our institution related to the type of arrhythmia and cardiac disease.

Methods. We retrospectively studied 55 procedures made in 41 patients. The period of inclusion was October 1995 to August 2008. Criteria for Inclusion were the existence of a congenital heart disease (operated or not) and at least one procedure of catheter ablation.

Results. The mean age was 33 years (range 3-72 y). 10 patients had more than one procedure, 7 for recurrence of the same arrhythmia and 3 for another arrhythmia. The distribution of arrhythmias was: 18 typical atrial flutter, 14 atypical atrial flutter, 6 accessory pathways, 3 atrial fibrillation and 1 intranodal re-entry. The distribution of cardiac disease is: 14 atrial septal defects (ASD), 8 tetralogy of Fallot (TOF), 5 Fontan palliation for tricuspid atresia, 3 double outlet right ventricle (DORV), 4 ventricular septal defect (VSD), 2 Ebstein, 2 Rastelli operations for L-transposition with VSD and pulmonary stenosis, 1 Senning and 1 total pulmonary abnormal return. The total procedure success rate was 83% including 6 patients in whom more than one procedure was made to achieve the success. Rate of success was different according to the arrhythmia (94% for typical atrial flutter, 71% for atypical atrial flutter, 83% for accessory pathways and 50% for atrial fibrillation) and the type of cardiopathy (89% in TOF, 71% in ASD, 80% in Fontan, 100% in Ebstein and 33% in DORV). There were no deaths. One patient was implanted with a pacemaker for severe sinus dysfunction not related to the ablation procedure.

Conclusions. Despite complex anatomy and multiple intracardiac scars complicating the ablation of arrhythmias in congenital heart disease, the results are good with no complications. In patients with Fontan palliation the success rate was encouraging, especially as we know arrhythmias can deeply destabilize their complex physiology. We therefore conclude that catheter ablation is the treatment of choice in this special population in which few antiarrhythmic drugs can be safely used. However we must keep in mind that in some complex cases the success can require more than one procedure.

Behaviour of polyester grafts in adult patients with repaired coarctation of the aorta. # — Els Troost, Marc Gewillig, Bart Meyns, Kristien Van Deyk, Werner Budts (*University Hospitals Leuven, Leuven, Belgium*).

Background. Whatever the technique used for surgical or endovascular repair of a coarctation of the aorta (CA), long term complications might occur. Aneurysm formation after iDacron® patch angioplasty, especially when a concomitant hypoplastic transverse arch is present, is not uncommon and may lead to a possibly life threatening condition. Therefore, we were interested in the long-term results of different types graft interposition, from which a lower degree of dilatation is expected.

Methods. All patients, currently older than 16 years, who underwent (redo) surgery for CA and in whom an interposition graft was used, were selected from the data base of congenital heart disease of our hospital. Follow-up data were collected by reviewing the patients' files. The degree of graft dilatation was calculated for each patient.

Results. Fifty-three patients (41 male, mean age 34 ± 9 years) could be included in the study and in whom 20 (38%) "Gelseal", 12 (23%) "Gelsoft" and 8 (15%) "Gelweave" grafts were used. Twenty patients underwent a primary repair and in all the others an interposition graft was implanted after a "Dacron" angioplasty. The median graft size was 18 mm (range 12-30 mm). The mean follow-up time of the grafts was 14 ± 8 years. The graft size increased to 28 ± 10 mm (50% increase in diameter, range 0-271%, $P < 0.0001$). Only six grafts remained unchanged during follow-up. Gelseal and Gelsoft knitted-type grafts were found to dilate more than Gelweave grafts ($P < 0.0001$). Three deaths occurred of which two were cardiac related. In eight patients re-interventions were performed - for false aneurysms in three cases and true aneurysm in two cases. The remaining indications for surgery were endarteritis in two cases and severe recoarctation in one patient.

Conclusions. Nearly all interposition grafts dilated up to 50% of their original size during follow-up. Knitted types of grafts have a tendency to dilate more than woven type of grafts. Re-interventions were inevitable in more than 10 percent of cases, primarily because of pseudo-aneurysm formation at the suture line. However true aneurysm formation is described in some older types of Dacron grafts. Our series illustrates that late complications are not uncommon, so that rigorous follow-up of these CA patients remains mandatory.

A modified technique of stent fenestration of the interatrial septum improves patients with pulmonary hypertension. # — Els Troost, Marion Delcroix, Marc Gewillig, Kristien Van Deyk, Werner Budts (*University Hospitals Leuven, Leuven, Belgium*).

Background. A significant number of patients with pulmonary hypertension are resistant to medical therapy. We wanted to evaluate whether the modified

technique of stent fenestration of the interatrial septum would be feasible and safe, and offer clinical benefit.

Methods. The medical records of all patients with pulmonary arterial hypertension and chronic thromboembolic pulmonary hypertension who underwent a stent fenestration of the interatrial septum between 2001 and 2008 were reviewed for statistical analysis. At different time points (at diagnosis, immediately before fenestration, and 3 to 4 months after fenestration), laboratory findings, lung function tests, transthoracic echocardiography, right heart catheterisation, and six minutes walk distance were reviewed.

Results. In all fifteen patients (12 female, mean age 48.2 ± 20.5 years) a successful fenestration procedure could be performed. Median follow up time between diagnosis and fenestration was 2.3 years (range from 0.5 to 18.6 years). Mean event free survival since diagnosis and after septostomy was 9.8 ± 2.9 and 3.2 ± 0.8 years, respectively. When one extreme outlier was excluded, the six minute walk distance improved significantly from 309 ± 69 m immediately before fenestration to 374 ± 84 m, 3 to 4 months after fenestration ($n = 8$, paired t-test, $P = 0.03$). No stent occlusion occurred.

Conclusions. The modified stent fenestration technique is feasible and safe in patients with severe pulmonary hypertension. In a selected group of patients, functional capacity might improve although disease progression continues.

The National Eisenmenger Registry: Descriptive and comparative analysis between Down and non Down patients.

— Alexander Van De Bruaene¹, Marion Delcroix¹, Agnès Pasquet², Julie De Backer³, Robert Naeije⁴, Bernard Paelinck⁵, Marielle Morissens¹, Jean-Luc Vachiéry⁴, Werner Budts¹ (¹University Hospitals, Leuven, Belgium, ²University Hospitals St Luc, Brussels, Belgium, ³University Hospital Gent, Gent, Belgium, ⁴Erasmus University Hospital, Brussels, Belgium, ⁵University Hospital, Antwerp, Belgium, ⁶CHU Brugman, Brussels, Belgium.)

Background. Pulmonary arterial hypertension (PAH) associated with congenital heart disease usually results from a systemic-to-pulmonary shunt and may lead to shunt reversal, causing the so-called Eisenmenger syndrome (ES). A national registry of ES patients was initiated to optimise patient care by facilitating research and the assessment of new treatment modalities.

Methods. All patients with ES, older than 18 years, were selected through the local databases of all participating centres in Belgium. After obtaining written informed consent, demographic, clinical, biochemical, technical, and treatment data were entered into the registry using a web based application.

Results. A total of 91 patients could be included in the registry. Mean age was 36.1 years (range 18–59 years). Complete atrioventricular septal defect ($N = 26$, 28.6%), followed by ventricular septal defect ($N = 25$, 27.5%) were the most common underlying defects. Forty-five percent of the global population were patients with Down syndrome. Down patients were younger (32.9 versus 40.1 years; $P = 0.039$), had worse functional capacity (Class II/III ratio: 15/16 versus 21/8; $P = 0.035$) and received significantly less specific treatment for PAH (7% versus 38%; $P = 0.002$).

Conclusions. Through the national Eisenmenger registry, 91 patients with ES were identified. Almost half of them were Down patients. Although most patients were receiving selective pulmonary vasodilators according to their functional class, most Down patients in Class III were not. Whether or not to treat Down patients with selective pulmonary vasodilators remains an important dilemma in current clinical management.

Single-centre results of PFO closure with a non-implantable device using radiofrequency. Δ — Paul Vermeersch, Gaëlle Vermeersch, Marc Vaerenberg (AZ Middelheim, Antwerp, Belgium).

Background.—Percutaneous closure of patent foramen ovale (PFO) to prevent recurrent paradoxical embolism is frequently performed. However, currently available closure devices are implantable, leaving a foreign structure in the atria. The PFx Closure System (Cierra, Inc., Redwood City, CA) is a novel method employing radiofrequency (RF) energy to effect closure of a PFO by welding the tissues of the septum primum and septum secundum together without leaving foreign material in the body. Procedural mid- and long term outcomes using the PFx Closure system are reported.

Methods. From November 2006 until April 2007, 6 patients (age 36–60 years, mean 47.5 ± 9 years) with a history of recurrent cryptogenic stroke or TIA and PFO were treated using the PFx catheter. The patients were taking part in the Paradigm II clinical study (prospective, non-randomized multicenter, single-arm study)

The PFx catheter is positioned over the PFO on the right atrial surface using fluoroscopy and TEE guidance. Once in place, vacuum is applied to hold the septum primum and septum secundum in place. The two layers of tissue are fused with RF energy applied via an electrode. All patients received 100 mg of aspirin and 75 mg of clopidogrel for at least 3 months. Transesophageal echocardiography (standardized protocol with contrast injection at rest and during Valsalva) (TEE) and ECG were carried out at 1.3.6 and 12 months post procedure.

Results. In all patients the catheter was successfully placed and energy applied. The average time of radiofrequency application using the PFX catheter time was 7 minutes (range 3-14 minutes) the mean balloon stretched diameter of the PFO was 10.5 ± 1.4 mm with an atrial septal aneurysm present in two patients. The follow-up was 12 months in every patient. No patient required blood transfusion; no other procedural complications were seen. There were no recurrent strokes/TIA's in the follow-up. Immediate closure was obtained in every patient, and closure was still 100% at the end of the study. No device related adverse events and no arrhythmias were observed.

Conclusions. Our initial and very limited experience demonstrates that the PFO closure using radiofrequency energy in lieu of an implantable device is technically feasible and safe.

Non-invasive cardiac imaging

Additional value of exercise echocardiography in dyspnoeic patients with normal echocardiography at rest. Δ — Anne Devoitille, Etienne Hoffer (*CHR Citadelle, Liège, Belgium*).

Background. Dyspnoea during moderate physical activity is a common complain. In this population, classical cardiac or pulmonary exploration may not provide satisfying etiological explanation. We therefore thought to evaluate the additional value of exercise echocardiography in this frequently seen clinical situation.

Methods. We prospectively studied 72 patients (pts) (60 ± 12 years, 49 women) with normal echocardiography at rest referred to our institution for complementary exploration of moderate dyspnoea during exercise (NHYA class 2) as unique symptom. Exercise echocardiography was performed in semi-supine position with continuous imaging monitoring.

Results. In 5pts, ischemic cardiomyopathy was highly suspected (apparition of segmental hypokinesia without any symptoms of angina). In 2pts, significant mitral regurgitation occurred. Apparition of atrio-ventricular bloc II type 2 was seen in 1pt. In 1pt, significant right-to-left shunt was observed throughout a patent foramen ovale. Weight excess and poor physical status was incriminated in 8pts. Inadequate blood pressure rising was seen in five cases. The most interesting finding was apparition of pulmonary hypertension (defined as systolic pulmonary artery pressure > 40 mmHg) in 38pts, without obvious etiological explanation (first expression of primitive pulmonary hypertension?).

Conclusions. Exercise echocardiography may provide useful information with potential clinical implications in pts complaining of dyspnoea during moderate exercise.

The lack of precision of a multidetector 64-slice-computed tomography in coronary patients can be improved using a tri-dimensional fusion image of the myocardial perfusion. # — Marcelo Goldstein, Guy Beersaerts, Yvan De Merlier, Marie-Antoinette Anckaert, Koen Erard, Philippe Lambert, Olivier De Coster, Frédéric Chapelle, Angel Lozano, Sébastien Neirinckx, Fabienne Vandewynckel (*BHC, Brussels, Belgium*).

Background. When the multidetector 64-slice-computed tomography coronary angiography (64-CTCA) is in the presence of a coronary calcification, a Stent, or a distal lesion, there is less precision in the diagnostic. The fusion image can provide a solution to this inconvenient. The purpose of this study was to obtain in a non-invasive manner a tri-dimensional (3D) fusion image of the myocardial perfusion by integrating a single-photon emission computed tomography (SPECT) with a multidetector (64-CTCA).

Methods. A 3D fusion image was performed in 45 patients with myocardial perfusion defect. As a first step, the myocardial perfusion defect was detected through Thallium 201 SPECT stress-rest, via images made by Infinia Hawkeye 4 g and computed by a Xeleris workstation, (GE Healthcare Technologies, Milwaukee, Wis). As a second step, a 64-CTCA (Light Speed VCT, GE) was performed on the same patients (Advantage Workstation, GE Healthcare Technologies). Finally, as a third step, 3D fusion images (Advantage Workstation, GE Healthcare Technologies) were obtained by integrating SPECT and 64-CTCA and the results of these images were compared to coronary angiographic segments (the gold-standard) which were undamaged, had a stenosis ($> 50\%$), had calcified atherosclerotic plaque or had a stent.

Results. Out of a total of 540 coronary angiographic segments examined in 45 patients, 494 coronary angiographic segments were evaluated while 46 segments (9%) were excluded from further analysis caused by a lack of visibility and/or poor quality images.

The results are as follows:

	Sensibility	Specificity	PPV	NPV
64 CTA*	87%	76%	60%	94%
3D Fusion*	93% +++	98% ++++	91%	98%

*: average segments PPV: Positive Prevalence Value - NPV: Negative Prevalence Value

+++ = $P < 0.009$, ++++ = $P < 0.0001$

Conclusions. When using 3D SPECT/64-CTCA fusion images, an improvement of the sensibility, specificity, PPV and NPV were observed. The specificity and PPV increase as a result of a better evaluation of the coronary arteries with a calcification, a Stent or a distal lesion.

Interest of a ‘triple rule out’ CT angiography in the evaluation of patients admitted in the emergency department (ED) for acute chest pain. Δ — Laurent Davin¹, Michel Lewin², Pierre-Julien Bruyère², Olivier Gach¹, Vincent Dorio³, Luc Piérard¹, Victor Legrand¹, Alexandre Ghuysen³ (¹CHU Cardiology Department, LIEGE, Belgium, ²CHU Radiology Department, Liège, Belgium, ³CHU Emergency Department, Liège, Belgium).

Background. Chest pain evaluation and diagnosis remain a challenging process in the ED. (CT) coronary angiography is a new technique for the non-invasive visualisation of the coronary arteries. Given the ability of conventional thorax CT angiography to evaluate patients with other life-threatening diseases such as aortic dissection and pulmonary embolus, we designed the present trial in order to investigate the potential benefit of a “triple rule out” imaging technique in the acute chest pain diagnosis algorithm.

Methods. We conducted a prospective, blinded study in patients presenting with acute chest pain to the ED between March and July 2008. 55 patients (33 men, 22 women; mean age, 58.3 years; range, 26-90 years) with atypical or typical chest pain and no ischemic ECG changes or positive biomarkers were included in the study and imaged with a 64 slices CT. Thoracic CT angiography with retrospective gating was performed with a single biphasic injection of 140 ml of iso-osmolar contrast material (at 5 ml/sec followed by 40 ml saline flush at 5 ml/sec) in caudal-to-cranial acquisition. Coronary, aortic, and pulmonary arterial system were imaged.

Results: Among these 55 patients: 36 were current smokers, 21 have hyperlipidemia, 6 presented diabetes mellitus, 24 were treated for a systemic hypertension and 22 patients have a personal history of cardiovascular disease. In the group of patients with typical chest pain, the TIMI risk score was evaluated (16 patients with a score of 0 to 3, 10 patients with 3-4 points and 2 patients with a score of 5).

Serious coronary stenoses were identified in 7 (12, 7%) patients, several extra-coronary pathologies were detected in 20 (36, 4%) patients and 11 (20%) patients presented exams without precise description of the coronary tree. Any significant coronary or thoracic lesion was found in 21 (38, 2%) patients and 47, 3% of exams were completely diagnostic and determined aetiology of the chest pain.

Conclusions: CT angiography and the “Triple rule out” technique in patients with acute chest pain admitted in ED allowed diagnosing many cardiovascular-thoracic lesions very quickly. This concept could be developed in the future. Cost effectiveness and irradiation value should be analysed.

Selection of percutaneous aortic valve replacement candidates: echocardiographic assessment of aortic stenosis and aortic root morphology in comparison with cardiac catheterization and magnetic resonance imaging. $\#$ — Bernard Paelinck, Delphine Petillot, Christiaan Vrints, Johan Bosmans (*Antwerp University Hospital, Edegem, Belgium*).

Background. Percutaneous aortic valve replacement in patients presenting high risk for surgery is a promising new interventional treatment modality. The potential role of non-invasive imaging techniques in patient selection needs further validation. We aimed to compare 1. calculated aortic valve area (AVA) by cardiac catheterization with calculated AVA by Doppler, with AVA planimetry by 3D echocardiography and MR 2. aortic root dimensions by echocardiography with angiography and MR.

Methods. Twenty-eight high risk elderly symptomatic patients with severe aortic stenosis scheduled for potential percutaneous aortic valve replacement, were studied. AVA was calculated by cardiac catheterization using the Gorlin equation and by Doppler using the continuity equation. AVA was also determined by direct planimetry using 3D echocardiography and using steady state free precession MR. Diameter of aortic ring, sinus and sinotubular junction were measured using 2D echocardiography, invasive aortography and steady state free precession MR.

Results. Mean differences and 95% CI in AVA were 0.02 cm² (-0.04, 0.08) (p=NS) for catheterization versus Doppler echocardiography, -0.01 cm² (-0.08, 0.06) for catheterization versus 3D echocardiography (p=NS) and 0.01 cm² (-0.07, 0.08) for catheterization versus MR (p=NS).

Mean differences and 95% CI for diameter aortic ring, sinotubular junction and aortic sinus are displayed in table (*p < 0.05).

	Mean difference 2D echocardiography versus invasive MR	
ring (cm)	0.42 (0.29, 0.55)*	-0.05 (-0.12, 0.02)
sinus (cm)	0.03 (-0.10, 0.17)	-0.10 (-0.20, 0)*
sinotubular junction (cm)	0.03 (-0.09, 0.15)	-0.13 (-0.23, -0.03)*

Conclusions. 1. Doppler, 3D echocardiography and MR planimetry provided an accurate estimate of AVA in comparison with catheterization. 2. Catheterization underestimates aortic ring dimensions, while MR overestimates aortic sinus and sinotubular junction dimensions in comparison with echocardiography.

ABSTRACT RETRACTED

Evaluation of aortic regurgitation: multidetector CT compared with cine MR imaging and transthoracic and transoesophageal echocardiography. #

Valérie Kersten, Céline Goffinet, Anne-Catherine Pouleur, Agnès Pasquet, Jean-Louis Vanoverschelde, Bernard Gerber (*Cliniques Universitaires Saint Luc, Brussels, Belgium*).

Background. Multidetector computed tomography (CT) and cine magnetic resonance (MR) have been proposed to evaluate the severity of aortic regurgitation (AR), but the estimated dimensions of the anatomic regurgitant orifice (ARO) has never been compared with the quantitative approach for calculating the effective regurgitant orifice (ERO) by transthoracic echocardiography (TTE). Secondly, previous studies showed that evaluation of the mechanism of AR (type I: aortic dilatation, type II: cusp prolapse and type III: restrictive cusp motion) is important in predicting its reparability, which is an attractive alternative to valve replacement. Accordingly, the aims of this study were to: 1) compare the feasibility and accuracy of CT and MR measurements of the ARO with TTE as the reference standard and 2) assess the ability of these techniques to define the mechanism of AR, using transoesophageal echocardiography (TEE) as reference.

Methods. 33 patients (26 men, 7 women; mean age 54 years \pm 10) with aortic regurgitation successfully underwent multidetector CT, cine MR, TEE and TTE before undergoing cardiac surgery. Two blind observers measured maximal ARO in diastole on both MDCT and cMR and measurements were compared with the ERO calculated with TTE, using the PISA method. Mechanisms of AR were categorized by CT and MR data and compared with TEE and surgical data.

Results. We observed a high correlation between measurements of ARO dimensions by CT and those carried out using MR ($r = 0.96$, $p < 0.001$) and TTE ($r = 0.92$, $p < 0.001$). Values measured using CT planimetry ($22.7 \pm 12.7 \text{ mm}^2$) were not significantly different from those determined with MR ($21.7 \pm 11.6 \text{ mm}^2$, $p = 0.14$) or the ERO calculated by the PISA method ($20.9 \pm 11.2 \text{ mm}^2$, $p = 0.09$). MR-derived ARO dimensions were also well correlated with TTE measurements ($r = 0.90$, $p < 0.001$) and did not differ significantly (from each other) ($p = 0.39$). The correlation between regurgitant volume determined by MR phase contrast imaging and by the PISA method was good. ($r = 0.91$, $p < 0.001$). The agreement between CT and TEE to categorize the mechanism of AR was 94% ($\kappa = 0.90$) versus 91% ($\kappa = 0.84$) between MR and TEE.

Conclusions. CT and MR allow accurate quantitative assessment of AR and provide correct anatomic assessment of all types of AR lesions. The ability of combining these measurements with non-invasive

coronary imaging, suggests that both techniques could be useful for comprehensive evaluation of patients with AR prior to valve repair surgery.

Multislice cardiac computed tomography allows for significant cost savings in patients with an intermediate cardiac risk profile. Δ — Karel Wallecan, Joris Mahieu, Peter Gorissen, Rodrigo Salgado, Christiaan Vrints, Bharati Shivalkar (*Antwerp University Hospital, Edegem, Belgium*).

Background. 64-slice Computed Tomographic angiography (CTA) has high diagnostic accuracy for detection of significant coronary artery disease (CAD) and may therefore avoid unnecessary and expensive Coronary Angiographies (CA). We examined the hypothesis that CTA, compared to bicycle ergometry (Ergo), is accurate, cost-saving and avoiding unnecessary CAs when diagnosing CAD in patients with an intermediate risk profile and atypical chest complaints.

Methods. 118 patients (69 men, 49 women; 56.6 ± 5.0 years) with atypical chest pain and intermediate cardiovascular risk profile (2-5% ten-year risk of fatal cardiovascular disease, SCORE, Belgium) underwent both CTA and Ergo. We performed a retrospective cost-analysis of two diagnostic approaches for detecting CAD: 1. CTA as the only diagnostic modality compared to Ergo (CTA vs. Ergo) and 2. CTA only versus Ergo followed by CTA depending on the result (CTA vs. Ergo \pm CTA). Follow up-data (88 ± 26 weeks) for measuring diagnostic accuracy included CAD-related cardiac events or the results of a CA performed after a positive or inconclusive CTA. Using diagnostic accuracies and costs per diagnostic modality (CTA 263 €, Ergo 82 €, CA 2694 €), we calculated the incremental costs per extra correct diagnosis and cost savings made per patient by using CTA and avoiding unnecessary CA. This was done for both approaches.

Results. In patients with normal CTA, there were no cardiac events during follow-up. Sensitivity and NPV of CTA compared to Ergo was very high (100 vs. 50 and 100 vs. 97% respectively). Cost-analysis for "CTA vs. Ergo" showed an incremental cost of 668 € per extra correct diagnosis, but a cost-saving of 504 € per patient by avoiding extra costs of an unnecessary CA because of lower diagnostic accuracy of Ergo.

For "CTA vs. Ergometry \pm CTA", we calculated an incremental cost of 4509 € per extra correct diagnosis. Although this resulted in extra costs for the use of CTA of 76 € per patient, CTA had a higher accuracy for detecting CAD, generating no false negative results, and saved costs in the long term due to the early correct diagnosis and avoiding unneeded, expensive and invasive CA's. For both approaches, the costs were less and savings greater for women.

Conclusions. Although there is an incremental cost for one extra correct diagnosis, significant cost-savings can be made by avoiding unnecessary invasive angiographies when assessing patients with intermediate risk profile directly with CTA instead of Cycloergometry. These savings are even more beneficial for women because cycloergometry tends to have more false positive results in this group.

Acute cardiology

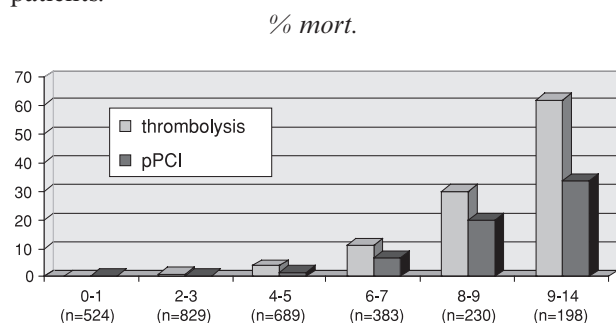
Mortality benefit of primary PCI over thrombolysis is highly dependent on baseline risk profile. A population study of STEMI patients in Belgium. $\#$ — Marc Claey's¹, Antoine de Meester², Carl Convens³, Philippe Dubois⁴, Jean Boland⁵, Herbert De Raedt⁶, Pascal Vranckx⁷, Sofie Gevaert⁸, Peter Sinnaeve⁹, Patrick Evrard¹⁰ (¹*University Hospital, Antwerp, Belgium*, ²*Hôpital, Jolimont, Belgium*, ³*ZNA, Antwerp, Belgium*, ⁴*CHU, Charleroi, Belgium*, ⁵*CHR Citadelle, Liège, Belgium*, ⁶*OLV, Aalst, Belgium*, ⁷*Virga Jesse, Hasselt, Belgium*, ⁸*University Hospital, Gent, Belgium*, ⁹*University Hospitals Leuven, Leuven, Belgium*, ¹⁰*Clinique Universit. Mont-Godinne, Belgium*).

Background. Recent STEMI guidelines recommend primary PCI (pPCI) as the preferred reperfusion therapy in STEMI patients, including those admitted in non-PCI centres. As the availability of PCI facilities and/or transfer facilities is still restricted in many regions worldwide, there is a clear need for adequate selection of STEMI patients (pts) who will benefit most from pPCI. The present study evaluates whether a simple clinical tool, such as the TIMI risk score, can be helpful for selecting the optimal reperfusion strategy.

Methods and Results. In-hospital mortality was prospectively assessed in 2853 Belgian STEMI pts admitted in 70 hospitals and related to baseline risk profile and reperfusion strategy. 2418 pts were treated by pPCI and 435 pts. received thrombolysis of which 378 pts. (87%) underwent coronary angiography either in the acute phase (rescue PCI in 139 pts) or electively during hospitalisation (n = 239 pts). Overall mortality was lower in pPCI pts than in thrombolytic pts: 5.6% versus 6.9% (unadjusted p = 0.3). Mortality benefit was dependent on baseline risk profile, however (adjusted p value = 0.01, see figure). Pts with TIMI risk score < 4 (e.g. pts below 75y of age with a Killip class of 1 and total ischemic time < 4h) had an excellent prognosis independent of the type of reperfusion therapy chosen (in-hospital mortality < 1%).

Conclusion. Simple clinical characteristics on admission identify low risk patients who have an excellent prognosis, independent of the type of reperfusion strategy. Thus, in situations where direct access to a

PCI facility is restricted, initial therapy with thrombolysis is a valuable alternative to p PCI in low-risk patients.



Gender specific changes of 28-days outcome after hospital admission for myocardial infarction during the period 1985-2004 observed by a Belgian epidemiological registry (MONICA-BELLUX). # — Erwin Schroeder¹, Jacques Jamart¹, Sylvie Swales¹, Guillaume Wunsch¹, Christian Brohet¹, Victor Legrand², Bernard Masuy¹, Michel Jeanjean¹ (¹University Hospital of Mont-Godinne, Yvoir, Belgium, ²University Hospital of Liège, Liège, Belgium).

Background. To assess gender specific differences of outcome after myocardial infarction (MI) we report results from a population based survey.

Methods and results. The MONICA-BELLUX survey aims the detection of all myocardial infarctions according to the WHO-MONICA definitions within the population (age: 35-74 years) from the Belgian

province of Luxembourg (target population in 2004: n = 54.915 men and 56.360 women. According to the WHO-MONICA diagnostic algorithm (symptoms, ECG changes, CKmB) MI were classified as definite (non fatal: NF₁, fatal: F₁). Deaths of possible coronary origin (F₂) and without other evident causes (F₉) were also classified as MI.

Attack or incidence rates reflect the following events: NF₁ + F₁ + F₂ + F₉.

The 28 days-mortality reflects the ratio: F₁ + F₂ + F₉ / NF₁ + F₁ + F₂ + F₉.

The annual event rates are age-adjusted (European standard) and expressed as events/10.000 citizens. Changes over time were assessed by the Poisson regression analysis. We observed a significant decrease of the incidence of first and recurrent myocardial infarction (fatal and non fatal) during the 20 year-period (1985-2004) in men and in women. The overall 28 days-mortality of myocardial infarction (based in the WHO-MONICA criteria) however remained unchanged over time (± 50%).

For the patients admitted to the hospital for their first myocardial infarction a marked decrease of the 28-days mortality was observed in men, but not in women.

Conclusion. The improvement of the outcome of MI admitted to hospitals over a 20-year period is confirmed by this epidemiological survey, probably by the widespread use of more efficient therapeutic tools.

This favourable trend was only observed in men but not in women. Larger epidemiological studies of the therapeutic management are needed to understand and to possibly indicate the tools to abolish this gender specific discrepancy.

Annual events data	MEN		WOMEN	
	1985	2004	1985	2004
Age-adjusted attack rates (events/10.000)	72	28*	17	6*
Age-adjusted incidence rates (all events) (events/10.000)	55	23*	15	5*
Age-adjusted incidence rate (fatal events) (events/10.000)	28	13*	9	3*
Age-adjusted 28 mortality in pts admitted to hospital (%)	25	16*	27	26

* 2004 vs. 1985

P < 0.01

GRACE risk score in patients with acute coronary syndrome: the practical utility at hospital admission.

— Mariana Floria¹, Ciprian Rezus², Romeo Artenie³, Mirela Ciutea², Ana Saulea³, Oana Rodica Landea³, Ramona Elena Barzu³, Raluca Vasiluta³, Valentin Ambarus² (¹II Medical Clinic-“St. Spiridon” University Hospital, Lasi, Romania, ²III Cardiology Clinic, University of Medicine and Pharmacy “GR.T.Popa”, Lasi, Romania, ³III Cardiology Clinic-“St. Spiridon” University Hospital, Lasi, Romania,

Background. Accurate risk stratification soon after admission for patients with acute coronary syndromes (ACS) based only on clinical parameters is vital in guiding management. The Global Registry Acute Coronary Events (GRACE) risk is a prediction tool that is readily available to clinicians in smaller community hospitals.

Methods. We aimed to assess the practical utility of GRACE risk score in unselected patients with ACS at hospital admission. We enrolled 145 patients with ACS at hospital admission: ST segment elevation myocardial

infarction-STEMI (30%), non-ST segment elevation myocardial infarction (3%) and unstable angina (67%). We analyzed the presence of recurrent angina and deaths between patients with average and high risk score using GRACE risk score at admission.

Results. Mean age was 66 ± 12 years and 52.4% were men. All patients underwent a non-invasive treatment. Only 18% of patients with STEMI were eligible for receiving fibrinolytic therapy. High and average risk score were present in 96 (66%) and 37 (26%) patients, respectively. In 39 of those patients was objected recurrent angina during hospitalization. Positive predictive value of a high risk score in recurrent angina prediction was 79%. The probability of death for the patients with a GRACE risk score > 200 was 27%.

Conclusions. GRACE risk score could be useful at hospital admission patients. It could be used as predictor of recurrent angina and death. Therefore this clinical score should be utilized for selection of patients in which a more invasive attitude is necessary, immediately after patient admission in smaller community hospitals.

Impact of the modality of arrival in the emergency department for the patients with a STEMI on the clinical outcome in terms of LVEF and survival.

Δ — Céline Rousseaux, Rachid Briki, Michel de Marneffe, Jean-Luc Vandebossche, Pierre Mols (CHU Saint-Pierre, Brussels, Belgium).

Background. Emergency Medical Services (EMSs) play a key role in the recognition and treatment of ST-segment elevation myocardial infarction (STEMI). This study evaluates patient outcome according to his mode of arrival in the care unit dealing with acute coronary syndromes.

Methods. Retrospective analysis of STEMI infarctions registered by the Belgian Interdisciplinary Working Group on Acute Cardiology (BIWAC) at St-Pierre University Hospital, Brussels (CHU St-Pierre), between 01/01/2005 and 31/12/2006. Comparison of two groups according to their arrival in the care system: **group 1:** brought in following an emergency call by mobile medical team (SMUR) or normal ambulance; **group 2:** arrived at the hospital by their own means and classic admission to Emergency Service. Studied parameters: descriptive patient characteristics, localisation of the infarction and survival to the end of hospitalisation, to six months and to one year.

Results. Of 139 patients, 57.5% arrived by EMS and 42.5% by their own means. Patients who arrived by EMS were older ($p = 0.008$) and had a higher Killip score ($p < 0.05$). Pain-to-Angiography and Door-to-Angiography intervals were shorter in patients who arrived by EMS (215 vs. 416 mins, $p < 0.0001$ and 62.4 vs. 147 mins, $p < 0.0001$, respectively). There were

no differences in the left ventricular ejection fraction (LVEF) and survival. However, for patients suffering an IVA attack, survival to six months and one year was better in the EMS group (82.1% vs. 78.3%, $p < 0.05$ and 74.4% vs. 69.6%, $p = 0.05$).

Conclusions. Dealing with STEMI infarctions is quicker by EMS admission. The infarctions admitted by this way are more serious. Wherever STEMI infarctions were localised, no improvement of LV function and survival was observed according to the mode of arrival, contrary to the subgroup with an IVA attack where survival is better at six months and one year by EMS admission.

Hypertension and vascular biology

Decreased ventilatory response to exercise by dopamine-induced inhibition of peripheral chemosensitivity. #

— Christophe Janssen, Sofia Beloka, Patricia Kayembe, Gaël Deboeck, Dionysios Adamopoulos, Robert Naeije, Philippe van de Borne (ULB, Brussels, Belgium).

Background. The contribution of the peripheral chemoreflex to the ventilatory response to exercise and aerobic exercise capacity remains incompletely understood. Low-dose dopamine has been reported to specifically inhibit the peripheral chemoreceptors.

Methods. We investigated the effects of intravenous dopamine ($3 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) on muscle sympathetic nerve activity (MSNA), heart rate, blood pressure, pulse oximetry (SpO_2) and ventilation (V_E) during normoxia, isocapnic hypoxia, hyperoxic hypercapnia, a handgrip manoeuvre, and on cardiopulmonary exercise test variables, in 13 healthy young male subjects. The study was prospective, placebo-controlled, randomised and followed a cross-over design with more than 24 hours between placebo and dopamine administrations.

Results. Dopamine increased MSNA, heart rate and blood pressure in normoxia but not in hypercapnia or during handgrip manoeuvre. Dopamine decreased SpO_2 and V_E in hypoxia, and approximately halved the ventilatory response to hypoxia measured as V_E/SpO_2 (0.19 ± 0.09 vs. $0.09 \pm 0.09 \text{ L} \cdot \text{min}^{-1} \cdot \%^{-1} \cdot \text{m}^{-2}$, placebo vs. dopamine, $p = 0.002$). Dopamine decreased the V_E/VCO_2 output slope during the cardiopulmonary exercise test (23.09 ± 1.81 vs. 24.61 ± 1.84 , dopamine vs. placebo, $p = 0.025$), without affecting maximum workload, V_E and O_2 uptake.

Conclusions. We conclude that specific inhibition of peripheral chemoreflex function with dopamine decreases the ventilatory response to dynamic exercise, with no interference with the metabolic reflex, and no change in aerobic exercise capacity.

Chemoreflex function in exercise tolerance. *

Christophe Janssen, Sofia Beloka, Patricia Kayembe, Olivier Lheureux, Dionysios Adamopoulos, Gaël Deboeck, Robert Naeije, Philippe van de Borne (ULB - Erasme, Brussels, Belgium).

Background. The contribution of the peripheral chemoreflex to the ventilatory response to exercise and aerobic exercise capacity remains incompletely understood. Low-dose dopamine and digoxin has been reported to respectively inhibit and stimulate the peripheral chemoreceptors.

Methods. We investigated the effects of intravenous dopamine ($3 \mu\text{g.kg}^{-1}.\text{min}^{-1}$) and digoxin (0.01 mg.kg^{-1}) on muscle sympathetic nerve activity, heart rate, blood pressure, pulse oximetric oxygen saturation (SpO_2) and ventilation (V_E) during normoxia, isocapnic hypoxia, hyperoxic hypercapnia, a handgrip manoeuvre, and on cardiopulmonary exercise test variables, in 13 and 11 healthy young male subjects. The study was prospective, placebo-controlled, randomised and followed a cross-over design.

Results. The peripheral chemosensitivity, expressed as the ratio between V_E and SpO_2 during hypoxia, was approximately halved by dopamine (0.19 ± 0.09 vs. $0.09 \pm 0.09 \text{ L.min}^{-1}.\%^{-1}.\text{m}^{-2}$, placebo vs. dopamine, $p = 0.002$) and doubled by digoxin (0.067 ± 0.04 vs. $0.12 \pm 0.09 \text{ L.min}^{-1}.\%^{-1}.\text{m}^{-2}$, placebo vs. digoxin, $p = 0.043$). The ventilatory response to dynamic exercise, assessed by the ventilation to carbon dioxide production slope, was lowered by dopamine (24.61 ± 1.84 vs. 23.09 ± 1.81 , placebo vs. dopamine, $p = 0.025$) and enhanced from the anaerobic threshold with digoxin (30.4 ± 2.9 vs. 32.8 ± 3.7 , placebo vs. digoxin, $p = 0.039$), without any effect on the anaerobic threshold and the VO_2 max. The hemodynamic, ventilatory and sympathetic variables were not affected by the drugs during hypercapnia, and handgrip exercises.

Conclusions. Pharmacological inhibition and stimulation of peripheral chemoreflex function respectively decreases and increases the ventilatory response to dynamic exercise, with no interference with the metabolic reflex, and no change in aerobic exercise capacity.

Influence of age on pulmonary arterial pressure in healthy beagle dogs: analysis by right ventricular catheterization and pulsed Doppler tissue imaging.

— Elise Mercier¹, Myrielle Mathieu², Cecile Clercx¹, Kathleen Mc Entee² (¹Faculty of Veterinary Medicine, Liège, Belgium, ²Faculty of Medicine, Brussels, Belgium).

Background. Pulmonary arterial pressure (Ppa) increases with age in healthy subjects and this has been attributed to vascular resistance. Tricuspid annular velocities determined by pulsed-wave Doppler tissue

imaging (TDI) are also age dependent. The aims of this study were to assess the influence of aging on pulmonary hemodynamics and haemorheological properties in healthy dogs and to evaluate the relationship between tricuspid lateral annulus TDI parameters and Ppa.

Methods. Fourteen healthy experimental beagle dogs from two age groups were used in the study, 8 young dogs aged 10 months to 5 years (mean: 2.7 years) and 6 old dogs aged 8 to 15 years (mean: 12.1 years). Haematology and biochemistry were measured. Pulsed-wave TDI of tricuspid free annular myocardial velocities were recorded to measure early (E') and late (A') diastolic myocardial velocities, isovolumic contraction velocity and systolic myocardial velocity. Under general anaesthesia, systolic, mean, diastolic and occluded Ppa, right atrial pressure and cardiac output were measured using a pediatric thermodilution Swan-Ganz catheter, while stroke volume, pulmonary vascular resistance, pulse pressure and compliance were calculated.

Results. Haematology and biochemistry measurements were not different between the 2 groups. Systolic, mean and diastolic Ppa were higher in old dogs compared with young dogs and this increase was attributed to a higher vascular resistance and lower compliance (Table 1). A' was increased in old compared to young dogs ($0.147 \pm 0.003 \text{ cm/s}$ vs. $0.109 \pm 0.009 \text{ cm/s}$, $p = 0.02$) and the E'/A' ratio was decreased (0.90 ± 0.05 vs. ± 0.06 , $p = 0.01$) while E' and systolic TDI variables were comparable between the 2 groups. Systolic (Figure 1), mean and diastolic Ppa were correlated with

Table 1: – Pulmonary hemodynamic indices

	Young dogs	Old dogs	P
Heart Rate (beats/min)	68.4 ± 2.3	65.1 ± 2.0	NS
Cardiac output (L/min)	1.89 ± 0.18	1.52 ± 0.12	NS
Systolic Ppa (mmHg)	21.4 ± 1.5	30.6 ± 2.1	0,003
Diastolic Ppa (mmHg)	9.5 ± 1.1	13.4 ± 1.4	0,046
Mean Ppa (mmHg)	13.7 ± 1.2	19.3 ± 1.8	0,022
Occluded Ppa (mmHg)	9.5 ± 1.4	10.7 ± 1.7	NS
Right atrial pressure (mmHg)	6.1 ± 1.1	8.0 ± 1.8	NS
Stroke volume (mL/beats)	28.0 ± 0.2	23.0 ± 0.1	NS
Resistance (mmHg/L.min-1)	2.3 ± 0.5	5.9 ± 0.5	<0,001
Pulse pressure (mmHg)	11.9 ± 0.7	17.2 ± 0.9	<0,001
Compliance (mL.beats-1/mmHg)	2.37 ± 0.20	1.36 ± 0.12	0,002

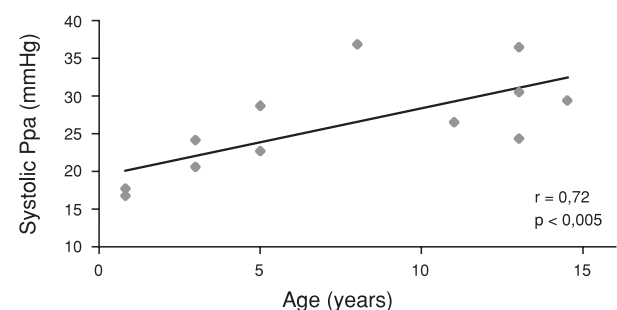


Fig. 1. – Systolic Ppa evolution with age.

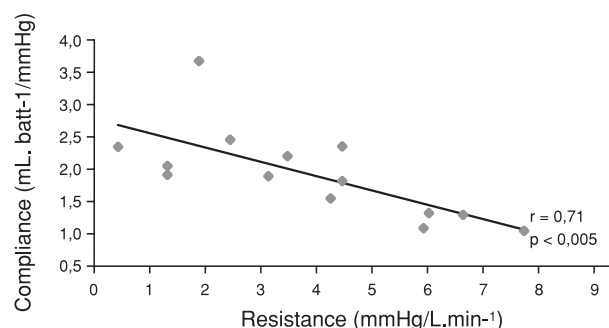


Fig. 2. – Relation between compliance and resistance.

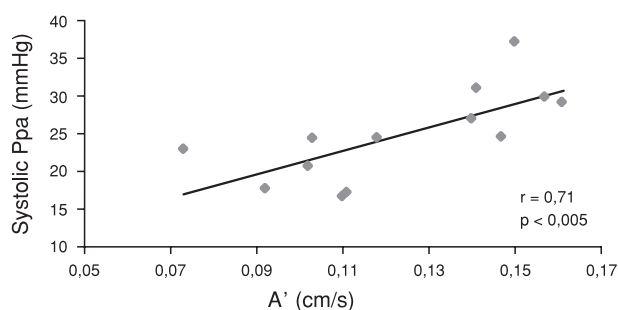


Fig. 3. – Relation between systolic Ppa and A'.

age, vascular resistance and compliance were inversely related (Figure 2). Maximal velocity of the A' wave was correlated with age ($r = 0.72$, $p < 0.005$) and with systolic Ppa (Figure 3).

Conclusions. A mild increase of Ppa is observed in old Beagle dogs compared to young Beagle dogs. Factors implicated are vascular resistance and compliance. The tricuspid free annulus late diastolic velocity is increased in old dogs and correlated to systolic Ppa.

Cyproheptadine prevents pergolide-induced valvulopathy in rats: an echocardiographic and histopathological study. # — Bram Roosens¹, Steven Droogmans¹, Bernard Cosyns¹, Céline Degaillier³, Sophie Hernot⁴, Caroline Weytjens¹, Christian Garbar³, Vicky Caveliers², Miriam Pipeleers-Marichal³, Philippe R. Franken⁴, Tony Lahoutte², Danny Schoors¹, Guy Van Camp¹ (¹Department of Cardiology, UZ Brussel, Brussels, Belgium, ²Department of Nuclear Medicine, UZ Brussel, Brussels, Belgium, ³Department of Pathology, UZ Brussel, Brussels, Belgium, ⁴In Vivo Cellular and Molecular Imaging (ICMI), Faculty of Medicine and Pharmacy, Vrije Universiteit Brussel (VUB), Brussels, Belgium).

Background. Serotonergic drugs such as pergolide have been associated with the development of cardiac valvular myxoid thickening and regurgitation in humans and more recently in rats. These effects are potentially mediated by the 5-hydroxytryptamine 2B receptor (5HT2BR). Therefore we sought to determine

whether cyproheptadine, a 5HT2BR antagonist, might prevent toxic valvulopathy in an animal model of pergolide-induced valvular heart disease.

Methods. Fifty male Wistar rats received daily intraperitoneal injections of pergolide 0.5 mg/kg ($n = 14$), pergolide 0.5 mg/kg combined with cyproheptadine 10 mg/kg ($n = 12$), cyproheptadine 10 mg/kg ($n = 12$) or no injections (control, $n = 12$) for 20 weeks. Echocardiography was performed blindly at baseline, 10 and 20 weeks followed by pathology.

Results. At baseline, no differences between groups were found with echocardiography. At 20 weeks, aortic regurgitation was present in all pergolide animals while it was less frequently observed in the other groups ($P < 0.0001$). For the other valves this difference was less pronounced. On histopathology, not only aortic but also mitral valves were more myxoid, thicker and exhibited more 5HT2BR positive cells in the pergolide animals compared to the other groups. Moreover, regurgitant aortic and mitral valves were thicker than non-regurgitant aortic and mitral valves.

Conclusions. We demonstrated that cyproheptadine prevents pergolide-induced valvulopathy in rats by reducing proliferation of 5HT2BR-positive cells. This may have important clinical implications for the prevention of serotonergic drug-induced valvular heart disease.

Reduction of circulating endothelial progenitor cells in chronic heart failure patients as a function of type D personality. Δ — Emeline Van Craenenbroeck¹, Johan Denollet², Paul Beckers¹, Nadine Possemiers¹, Kurt Wuyts¹, Vicky Hoymans¹, Christiaan Vrints¹, Viviane Conraads¹ (¹Department of Cardiology, Antwerp University Hospital, Edegem, Belgium, ²Center of Research on Psychology in Somatic diseases, Tilburg University, Tilburg, Netherlands).

Background. Type D personality - a joint tendency toward negative affectivity and social inhibition- is associated with poor prognosis in cardiovascular patients and increased concentrations of pro-inflammatory cytokines in chronic heart failure (CHF) patients. There is a further need to determine the mechanisms by which Type D personality traits affect outcome. Endothelial progenitor cells (EPC) are a surrogate biologic marker for vascular function and cumulative cardiovascular risk. We studied the number and function of circulating EPC in CHF patients in relation to the Type D construct.

Methods. Numbers of circulating CD34⁺/KDR⁺ cells (EPC) were determined by flow cytometry in 35 sedentary male CHF patients (LVEF $27.3 \pm 1.5\%$, 61.3 ± 2.1 yrs, 71% ischemic aetiology). Peripheral blood mononuclear cells were cultured in an endothelial growth medium to generate early acLDL+/lectin+

EPC. Migratory activity towards VEGF and SDF-1 α was assessed using a modified Boyden chamber assay.

All 35 patients completed the 14-item Type D Scale (DS14). The DS14 comprises a 7-item subscale measuring negative affectivity and a 7-item subscale measuring social inhibition. A cut-off of 10 on both DS14 subscales determined Type D personality.

Results. 10 out of the 35 CHF patients were classified as Type D. Circulating EPC numbers were significantly reduced by 54% in Type D patients ($0.084 \pm 0.055\%$ of lymphocytes, mean \pm SEM) compared to non-Type D patients ($0.183 \pm 0.029\%$, $p = 0.006$). There was no significant difference in the CD34⁺ cell number between type D and non-type D patients ($0.33 \pm 0.1\%$ vs. $0.55 \pm 0.09\%$, $p = 0.2$). An effect size of 0.4 indicates that Type D personality has a moderate effect on EPC numbers. In comparison, advanced age (0.08) and unfavorable standard cardiovascular risk profile (0.2) have a smaller effect size. The number of circulating EPC was not related to determinants of disease severity such as poor LVEF and reduced VO₂peak (all $p > 0.05$).

Migratory capacity correlated with VO₂peak ($r = 0.423$, $p = 0.013$) and inversely with the VE/VCO₂slope ($r = -0.351$, $p = 0.045$). However, migratory activity of early EPC was not different in Type D versus non-Type D patients ($34.8 \pm 3.4\%$ vs. $39.3 \pm 4.9\%$, $p = 0.47$).

Conclusions. These preliminary data suggest that Type D personality is related to a reduced number of circulating EPC in CHF. The present study is the first to suggest that Type D personality may contribute to the pathophysiology of cardiovascular disease by mediating the number of circulating EPC.

Interventional cardiology

Clinical evaluation of the safety and performance of percutaneous implantation of the 18 Fr CoreValve aortic valve prosthesis for patients presenting high risk for surgical valve replacement. # — Johan Bosmans, Inez Rodrigus, Bernard Paelinck, Marc Claeys, Chris Vrints, Corevalve Registry Investigators (*University Hospital Antwerp, Edegem, Belgium*).

Background. Percutaneous aortic valve replacement (PAVR) in patients presenting high risk for surgery is a promising new interventional treatment modality. The aim of this prospective, multicenter, registry is to evaluate the feasibility, the performance and the safety of the 18 Fr CoreValve self-expanding bioprosthesis, as well as the acute and long-term benefits of the procedure.

Methods. Patients presenting with symptomatic aortic native valve stenosis necessitating valve replacement, but considered high surgical risk, were included. All patients were > 75 years old, and/or had a surgical risk calculated with the logistic Euroscore $> 15\%$, or

were > 65 years old with at least 2 severe co-morbidities. The percutaneous valve was deployed by a purely percutaneous retrograde arterial intravascular delivery catheter system, after performing balloon valvuloplasty. Implantation was performed under local or general anaesthesia. Arterial access was closed using the ProStar closure device. Valve deployment occurred without rapid pacing. After implantation all patients were treated with clopidogrel and aspirin for 6 months.

Results. 536 patients (52% female, 48% male; age 80.9 ± 6.7 years) were included. Mean logistic Euroscore was 23.1 ± 3.7 . Percutaneous valve implantation was successful in 520/536 (97%), and failed in 16/536 (3%) (misplacement of the valve, aortic dissection or perforation, access vessel bleeding, LV perforation). Mean procedural time was 128 ± 47 min. 504/536 (94%) of the patients could be discharged alive and well with the Corevalve prosthesis. In the successfully implanted patients, the mean gradient after valve implantation was 2.71 ± 4.73 mm Hg and the mean calculated aortic valve area 1.9 ± 0.4 cm². Severe paravalvular leak (grade III or IV) never occurred. Incidence of stroke/TIA was 3% (10/536). 9% of patients (48/536) required definite pacemaker implantation. All cause 30-day mortality was 8% (44/536). Reasons of mortality were: heart failure, cardiac arrest, aortic dissection, pneumonia, septicaemia, brain haemorrhage and stroke. After successful valve implantation, valve dysfunction or migration never occurred. At discharge, all patients were functionally in NYHA class I (40%), class II (42%), class III (16%) or class IV (2%). There were no major clinical events (death, myocardial infarction, stroke) in initial follow-up, till 202 ± 103 ($194 - 336$) days after valve implantation ($n = 107$). Long-term echographic follow-up of mean valve gradient remained unchanged.

Data collected through end of 2008 will be presented for the above parameters.

Conclusions. Percutaneous aortic valve replacement with the 18Fr CoreValve revalving system has been shown to be a safe and effective procedure in symptomatic “high-risk” aortic stenosis patients. The implantation technique has evolved towards a pure percutaneous procedure. As with novel technologies PAVR has a definite learning curve which requires an in-depth understanding of patient selection and various anatomical criteria. Long-term efficacy and durability of PAVR in patients with aortic stenosis needs to be determined by future randomized prospective trials, compared to golden standard therapy.

Comparison of two point-of-care assays to evaluate post-clopidogrel platelet reactivity. Δ — Jamie Breugelmans, Marc Claeys, Francine Vertessen, Anke Verlinden, Marc Van der Planken, Christiaan Vrints (*University Hospital, Antwerp, Belgium*).

Background. Clopidogrel responsiveness has been encountered as an important determinant of thrombotic complications after coronary stent implantation. Rapid assessment of platelet function might therefore be of clinical value. The present study compares the performance of two point-of care assays: “ADP-test High Sensitivity” of the Multiplate[®] impedance aggregometer (MP, Dynabyte GmbH, Germany) and the “P2Y12 assay” of the VerifyNow[®] light-transmittance aggregometer (VFN, Accumetrics Inc., USA).

Methods. Twenty patients treated with clopidogrel and aspirin were included in the study. The MP and VFN assays were performed according to the manufacturers’ prescription, respectively on heparinized and citrated whole blood and repeated after 1 hour. Both assays yield quantitative results expressed as units (U) for the MP and P2Y12 reaction units (PRU) for the VFN.

Results. The average platelet function was 30 ± 44 U for the MP and 186 ± 173 PRU for the VFN. The two methods showed a sufficient reproducibility with an average difference between 1 hour interval measurements of 28% for the MP and 8% for the VFN. In 7/20 patients VFN test results were not reliable because of too low hematocrit values, in 4/20 patients hematocrit could be considered borderline and in 6/40 analysis device errors occurred. The MP is free from interference by hematocrit and suffered no device errors in our study. It is important to note that although the VFN has a flagging for low hematocrit values ($< 33\%$), it still generated results in 5/7 subjects with too low hematocrit, which could lead to an underestimation of the number of low-responders.

The linear regression between the MP and VFN assay was poor ($y = 26.5 + 0.0075 x$, $p > 0.1$). According to the VFN cut-off of ≥ 235 PRU, suggested by Price et al. Eur Heart J (2008), 5/17 (29%) patients were identified as low-responders. According to MP low reference value and cut-off of ≥ 46 U, 5/20 (25%) patients showed evidence of low clopidogrel response. Concordance between both tests was poor 9/17 (53%). Discordances might be partly due to interference of the VFN assay by low hematocrit values $< 33\%$.

Conclusion. The evaluation of two different point-of-care platelet function assays revealed an overall acceptable performance for both tests (cf reproducibility), but with more device and interference errors for the VerifyNow. Poor correlation between both tests precludes translation of low-responder criteria of the VerifyNow to the Multiplate. In the future, clinical trials need to be undertaken to determine the appropriate clinical cut-off value of low clopidogrel responsiveness for both point-of-care tests.

Meester, Vincent Thijs, Van Deyk Kristien, Werner Budts (UZ Leuven, Leuven, Belgium).

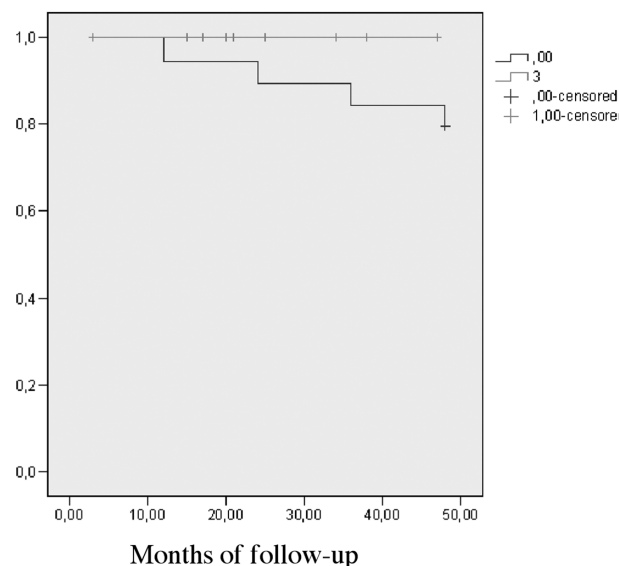
Background. Preliminary studies suggest that left atrial appendage (LAA) closure may be beneficial in the prevention of stroke in patients with atrial fibrillation (AF). Percutaneous devices have been developed for this purpose. The objective of our study was to evaluate the preliminary clinical efficacy of percutaneous LAA closure using the PLAATO-device (ev3 Endovascular, Inc., North Plymouth, MN).

Methods. Ten patients (9 male, mean age 73 ± 5 y) were included in a single-centre prospective follow-up study. The patients, in whom oral anticoagulants were contraindicated or have been proven to be insufficient for the treatment of chronic AF, underwent a percutaneous closure of the LAA with the PLAATO device (ev3 Endovascular, Inc., North Plymouth, MN). All new thrombo-embolic events were reported and the incidence was compared with values obtained by a theoretical model based on the CHADS2 scoring system.

Results. In nine patients, the LAA was closed percutaneously (90% success rate). The median follow-up time of the patients’ cohort was 21 months (range 3-47 months). One patient died of a non thrombo-embolic cause three months after the closing procedure. None of the patients in whom the LAA was successfully closed, suffered from thrombo-embolic events (100% versus the expected 80% event free survival at maximal follow-up time; log rank test, $P = 0.37$, figure).

Conclusions. Percutaneous closure of the LAA might be a valuable technique for AF patients with contra-indications for oral anticoagulation to prevent thrombo-embolic events. However, validation of these findings in larger trials is necessary.

Proportion thrombo-embolic event free



The use of an Amplatzer occluder device for the repair of a paravalvular leak near to a prosthetic valve.

Δ — Nadia Dobbeleir, Frank Van den Branden, Paul Vermeersch (*Middelheim Ziekenhuis, Antwerp, Belgium*).

Background. Following mitral valve replacement, surgical closure of paravalvular leaks (PVL's) is usually advised in severely symptomatic patients and in those requiring blood transfusions for persisting haemolysis. Consecutive operations are associated with a higher mortality and a higher risk of recurrent paravalvular leaks. We describe a case of a successful transcatheter treatment of severe paravalvular mitral regurgitation and pulmonary oedema in a patient in who repeat mitral valve replacement would be associated with a high operative risk.

Case: An 81 year old woman, who underwent a mitral valve replacement in 1978 which was replaced by a prosthetic mechanical mitral valve in 1982 and got a new mitral bioprosthesis because of a significant mitral paravalvular leak in 2005, presented with progressive heart failure and a haemolytic anemia. Because of the existence of a new paravalvular leak and because of a high operative risk a percutaneous closure was successfully performed with an amplatzer device. Post-operative cardiac ultrasound revealed only a mild regurgitation. She was discharged shortly after the procedure in good physical condition.

Conclusions. Percutaneous repair of perivalvular regurgitation near to a prosthetic valve is a feasible alternative to open surgical correction and may be preferred in patients with a significant perioperative risk. Further experience with careful attention to patient selection, late morbidity and mortality is required.

Early intraventricular conduction abnormalities after percutaneous aortic balloon valvuloplasty.

— Dirk Faes, Jean Renkin, Jim Reisch, Anne Seron, Jean-Louis Vanoverschelde, Joelle Kefer (*University Hospital of Louvain, Brussels, Belgium*).

Background. Percutaneous Aortic Balloon Valvuloplasty (PBAV) is considered as a therapeutic option in patients with aortic stenosis at high surgical risk. Rhythm abnormalities (atrioventricular block or new bundle branch block) are well-described complications of surgical aortic valve replacement, probably related to the injury of the conduction tissue close to the aortic annulus. Little is known about arrhythmia occurring at the early phase after PBAV.

Methods. Between January 2006 and September 2008, 34 consecutive patients (15 men, 85 +/- 6 yrs) were treated in our institution by PBAV. The mean logistic euroscore of the patients was 48 +/- 22%, the mean left ventricle ejection fraction was 32 +/- 15%,

the mean NYHA-class was 3 +/- 0.7. Aortic valve area was measured at 0.5 +/- 0.2 cm² and the mean transvalvular gradient at 40 +/- 18 mmHg before PBAV.

We retrospectively examined the incidence of post-procedural conduction abnormalities, by analysis of the standard 12-lead electrocardiogram (ECG) before, 24 hours and 1 month after the procedure. In addition, a continuous ECG monitoring was performed for 48 hours after the procedure.

Results. After PBAV, aortic valve area significantly increased to 0.8 +/- 0.2 cm² and the mean transvalvular gradient significantly decreased to 23 +/- 12 mmHg ($p < 0.0001$ for both *vs.* pre-procedure). Complications during the procedure were rare (no death, no stroke, 2 cases of ventricular tachycardia requiring electrical cardioversion, 3 pericardial effusions treated by pericardiocentesis, one femoral pseudoaneurysm, one severe arterial hypotension). The mean balloon/annulus ratio was 1.1 +/- 0.08.

At baseline, 3 patients (8%) had pre-existing permanent pacemakers, 10 (29%) patients had pre-existing complete left bundle branch block, 2 patients (6%) had pre-existing first degree atrio-ventricular block, 3 patients (8%) had right bundle branch block and 7 patients (20%) were in permanent atrial fibrillation. After PBAV, there were no patients requiring pacemaker implantation. None of the patients developed a new complete atrio-ventricular block, but two patients (6%) developed a new complete left bundle branch block within 24 hours after the procedure, persistent after one month. In these two patients, the balloon/annulus ratio was > 1.2, which was significantly higher than in the other patients without ECG change ($p = 0.03$).

Conclusions. The present retrospective study demonstrates that PBAV is a safe procedure, which may induce a low rate of intraventricular conduction abnormalities. Balloon/annulus mismatch could be considered as a risk factor for the development of new left bundle branch block after the procedure.

Chronotropic impairment after surgical or transcatheter atrial septal defect closure.

— Martial Massin (*HUDERF - ULB, Brussels, Belgium*).

Background. In previous studies, an attenuated heart rate response to exercise has been noted in patients after surgical closure of atrial septal defect. The aim of this study was to compare the prevalence of chronotropic impairment after surgical and transcatheter closure of atrial septal defect.

Methods. 38 pediatric patients who underwent a surgical (group A, n = 18) or transcatheter closure (group B, n = 20) of atrial septal defect in our institution were prospectively included in the study. Treadmill exercise testing was performed using the Bruce walking treadmill protocol to voluntary exhaustion,

with continuous monitoring of heart rate and oxygen consumption.

Results. All the children were in sinus rhythm, and had normal values for peak oxygen uptake and endurance time. Exercise heart rate was significantly lower than normal in group A at the end of stage 2 (Z -score = $-0.71 \pm \text{SD } 1.02$), and in both groups at the end of stage 3 (Z -score = -2.06 ± 1.76 in A and -1.00 ± 0.71 in B) and at peak exercise (Z -score = -2.78 ± 2.14 in A and -0.81 ± 0.75 in B). However, the heart rate response to exercise was significantly less attenuated in group B than in group A. Moreover, maximal heart rate was $< -2\text{SD}$ in 8/18 surgical patients but in no patient of the group B.

Conclusions. The chronotropic impairment is significantly less important after transcatheter closure of atrial septal defect than after surgical closure. It is an additional argument in favour of the interventional catheterization.

Percutaneous balloon aortic valvuloplasty induces an early reduction of B-type natriuretic peptide. Δ —

Xavier Muschart, Jean Renkin, Jim Reisch, Anne Seron, Jean-Louis Vanoverschelde, Joelle Kefer (University Hospital of Louvain, Brussels, Belgium).

Background. Percutaneous balloon aortic valvuloplasty (PBAV) is considered as a therapeutic option for patients with aortic stenosis at high surgical risk. Plasma levels of B-type natriuretic peptide (BNP) have been shown to predict outcome after surgical aortic valve replacement, but little is known about BNP and PBAV.

Methods. Between October 2007 and September 2008, 20 patients (10 males, 10 females, 86 ± 6 yrs) were treated by PBAV in our institution. The mean logistic euroscore of the patients was $46 \pm 23\%$, the mean left ventricle ejection fraction was $33 \pm 16\%$, the mean NYHA-class was 3.1 ± 0.8 . Aortic valve area was measured at $0.5 \pm 0.1 \text{ cm}^2$ and the mean transvalvular gradient at $41 \pm 17 \text{ mmHg}$ before PBAV.

The indication of PBAV was bridge to surgery in 3 patients, bridge to transcatheter heart valve in 8 patients, and was considered as a palliative option in 9 patients.

We measured BNP immediately before and 24 hours after PBAV, using the Biosite triage meter system. Patients were identified as “responders” whether a reduction of BNP plasma level superior to 200 pg/ml ($2 \times \text{ULN}$) was observed after the intervention.

Results. After PBAV, aortic valve area significantly increased to $0.8 \pm 0.2 \text{ cm}^2$ and the mean transvalvular gradient significantly decreased to $23 \pm 12 \text{ mmHg}$ ($p < 0.0001$ for both vs. pre PBAV). Procedural complications were rare (no death, no stroke, no vascular

complication and 1 case of ventricular tachycardia requiring electrical cardioversion).

BNP significantly decreased from 1706 ± 1444 to $1463 \pm 1316 \text{ pg/ml}$ after the procedure ($p = 0.02$). There was a good correlation between baseline serum level of BNP and left ventricle ejection fraction ($r = 0.52$).

We observed three deaths during the follow-up (5 ± 3 months); in these patients, baseline BNP was significantly higher (3797 ± 1210 vs. $1337 \pm 1153 \text{ pg/ml}$, $p = 0.001$) and left ventricle ejection fraction (17 ± 11 vs. $34 \pm 15\%$, $p = 0.03$) significantly lower as compared with survival patients.

All the patients in the responders group ($N = 9$) increased their functional class NYHA; by opposition, 6 patients of the non-responders group remained unchanged and only 5 increased their functional status. Improvement of NYHA-class was significantly superior in the responders group (from 3.4 ± 0.5 to 2.2 ± 0.4) as compared with the non-responders group (from 2.8 ± 0.7 to 2.4 ± 0.7 ; $p < 0.01$ for the comparison between both groups).

Conclusions. PBAV is a safe and effective procedure that induces an early reduction of BNP in patients with aortic stenosis at high surgical risk. Improvement of functional class NYHA was significantly higher in patients with a reduction of BNP superior to 200 pg/ml after PBAV.

PCI for acute myocardial infarction: changes in therapeutic management and impact on in-hospital outcome. # —

Philippe Boyazis, Jacques Jamart, Patrick Chenu, Vincent Dangoisse, Patrick Evrard, Laurence Gabriel, Antoine Guedes, I. Michaux, Baudouin Marchandise, J. Mortou, Dominique Vanpee, Erwin Schroeder. (University Hospital of Mont-Godinne, Mont-Godinne, Belgium).

Background. To assess the changes of therapeutic management and their impact on in-hospital outcome in patients undergoing PCI within 24 H of onset of ischemic symptoms.

Methods. During the 8-year period (1.1.2000 – 31.12.2007), 379 pts underwent PCI in this setting at our institution (81% for STEMI). Changes over time were assessed by comparing 4 2-year periods and 2 4-year periods (2000-2003 / 2004-2007). Multivessel PCI was performed in 19.5% during the initial hospital stay. PCI were classified as primary PCI, rescue PCI, PCI for contraindication for lytic therapy and systematic PCI. All bleedings (puncture-related or not) were classified according to TIMI definitions.

Results. No significant changes were observed over time for most clinical characteristics (including GRACE, TIMI scores), except an increase of the prevalence of diabetes ($8.3 \rightarrow 14.8\%$, $p = 0.06$) and a

	Period 2000-2003	Period 2004-2007	
Death (30 days) (%)	9	6	NS
Death + CABG + reinfarction (%)	10.2	6.7	NS
Death + CABG + reinfarction + CVA + rePCI (%)	12.1	8	NS
Puncture-related bleedings TIMI M/m (%)	5.1	1.8	p = 0.07
Other bleedings TIMI M/m (%)	1.9	4	NS
Death + CABG + reinfarction + CVA + rePCI + TIMI M/m (%)	16	12.1	NS

decrease of cases with cardiac arrest before PCI (13.5 → 6.1%, $p = 0.09$) and KILLIP 4 (15.4 → 9%, $p < .05$). Median time of ischemia was 6 H for primary PCI and 7.6 H for rescue PCI. Thrombolysis before PCI decreased from 56.8% in the first period (2000-2001) to 14.9% in the latest period (2006-2007); rescue PCI from 55.4% to 12.3%. Use of anti GP 2B/3A increased from 26.6% to 70% ($p < .001$). Radial approach was initially used in 1.5% and in 93% during the period 06-07. Prescription at hospital discharge of statins and ACE inhibitors increased from 12 to 83% and from 60 to 84%, respectively ($p < 0.01$). Median hospital stay decreased from 8 to 6 days ($p < 0.01$).

Conclusions. Major changes in therapeutic management have occurred during the last 8 years. Probably due to the limited number of events (single centre study), only favourable trends were observed for most in-hospital endpoints, except for non-vascular access puncture-related bleedings.

The long delay of onset of ischemia and reperfusion by PCI calls for an integrated regional approach of reperfusion and better patient education.

Prevalence impact and predictors of periprocedural myocardial infarction. Δ — S. Alisson, Laurence Gabriel, Antoine Guedes, Patrick Chenu, Vincent Dangoisse, Ch. Desonniaux, Patrick Evrard, E. Morandini, J.L. Paquay, Jacques Jamart, Baudouin Marchandise, Erwin Schroeder (*University Hospital of Mont-Godinne, Yvoir, Belgium*).

Background. During the last decade, important changes in PCI techniques (stents, anti GP 2B 3A) have occurred, as well as the extension of indications for PCI in more complex cases.

Methods and results. To assess the clinical impact of those changes, we analyzed the data of a consecutive series of 9049 hospital stays for PCI in our institution during the period 01.01.1996-31.12.2007.

Overall use of anti GP 2B 3A was 14%, 19.5% in patients (pts) with acute coronary syndromes (ACS). CKmB were systematically tested within 12-24 H. Myocardial infarctions (MI) were classified as Q-wave MI, non Q-wave MI > 5 ULN, and non Q-wave MI > 3 ULN. MI occurred in 2.5% of all cases (Q-wave MI in 0.4%, non Q-wave > 5 ULN in 1.2% and non

Q-wave > 3 ULN in 0.8%). Post PCI MI occurred in 2.3% during the early period (1996-98) and in 1.8% during the latest period (2005-07) (NS).

The use of anti GP 2B 3A was associated with procedural MI occurrence in 3.9 vs. 2.3% in cases without anti GP ($p < 0.001$). In the subgroup of patients with ACS ($n = 5172$), the use of anti GP 2B 3A was associated with procedural MI occurrence in 3.4% vs. 2.7% in cases without (NS).

In patients with ACS, only two variables predicted by multivariate analysis post PCI MI: multivessel disease (OR per vessel: 1.36) and angiographic success (OR: 0.44). In the entire group ($n = 9049$), occurrence of post PCI MI was predicted by: use of anti GP 2B 3A (OR: 1.90), multivessel disease (OR per vessel: 1.25), year of procedure (OR per recent year: 0.95), stable AP (OR: 0.69) and angiographic success (OR: 0.42).

In the entire group ($n = 9049$), in-hospital mortality was associated with cardiogenic shock (OR: 14.12), chronic renal failure (OR: 3.63), history of cerebrovascular disease (OR: 2.31), acute MI (OR: 2.83), NYHA (OR per class: 2.24), COPD (OR: 1.88), stable AP (OR: 0.57), angiographic success (OR: 0.46), and also by the occurrence of post procedural MI: Q-wave MI (OR: 21.29), non Q-wave MI > 5 ULN (OR: 7.03) and non Q-wave > 3 ULN (OR: 3.97).

Conclusions. Although slightly declining in recent years, post PCI MI remains a disturbing issue despite growing operator's experience, high stent penetration and more effective antiplatelet/anticoagulant therapies, as it has a major impact on in-hospital mortality according to the extent of myocardial necrosis.

Ti TAN2® (Hexacath, France), a titanium-NO coated stent: a drug-eluting-like bare metal stent? The Titan2® evaluation in Bonheiden, Belgium -TieBB-Registry. A retrospective single-centre 'real world' registry. Δ — Lieve Van Casteren¹, Philippe Debruyne¹, Bart Vankelecom¹, John Roosen¹, Erwin Raymenants², Serge De Ridder³, Luc Janssens¹ (¹Imelda Hospital, Bonheiden, Belgium, ²St. Maarten Hospital, Mechelen, Belgium, ³St. Elisabeth Hospital, Herentals, Belgium).

Background. Since recent reports have raised concerns about late thrombosis with drug-eluting stents, a

pursuit for safer alternatives is warranted. We investigated the Titan2[®], Hexacath France, a stainless steel stent coated with titanium-nitride-oxide, a so called bio-active stent. It claims to have DES- like properties with respect to in-stent restenosis, without the disadvantage of increased late thrombosis. We evaluated the safety and efficacy of the Titan2[®] stent in our daily clinical practice.

Methods. We evaluated all consecutive patients treated with one or more Hexacath Titan2[®] stents from January 2005 till December 2005. Both elective and urgent procedures were included. The choice of the stent was at the discretion of the operator without in- or exclusion criteria.

Results. A total of 237 lesions (stent length 15,1 mm +/-12,9 and diameter 3,0 mm +/- 2,0) were treated during 198 procedures (25,8% in the setting of an acute ST-elevation myocardial infarction (MI), 13,1% in a non ST-elevation myocardial infarction), including 193 patients (age 65,4 years, 75% men). Risk factors included diabetes mellitus (9,6%), hypercholesterolaemia (65,2%), hypertension (54,6%), active smoking (45,3%). The primary endpoint of the registry was major adverse cardiac events (MACE) at 30 days and 270 days. The cumulative incidence of MACE was 4,0% at 30 days, including 3,5% periprocedural non Q-wave myocardial infarctions, 0,5% acute myocardial infarctions urgent target lesion revascularisation (TLR) ('definite' stent thrombosis) and 0,5% cardiac death. At 270 days the rate of MACE was 18,2%, of which 11,6% TLR, 1,5% coronary artery bypass graft surgery (CABG), 6,1% myocardial infarction (1,0% Q-wave MI, in fact 2 patients had a 'definite' stent thrombosis - 5,1% non Q-wave MI of which 1,5% occurred after hospital discharge) and 2,5% cardiac death (1,0% with 'possible' stent thrombosis).

Conclusions. The Titan2[®] stent, Hexacath France, the first bio-active stent, did not satisfy our need for an indisputable alternative for drug-eluting stents. In our small single-centre study, it is associated with a rate of major adverse events, in particular target lesion revascularizations, similar to bare metal stents. This is in contrast to several recent studies in which the titanium-NO stent has drug-eluting-like properties, including reduced MACE. We hereby sharpen the need for further investigation of long-term efficacy and safety in large, randomized trials.

Re-examining minimal luminal diameter relocation and quantitative coronary angiography – Intravascular ultrasound correlations in stented saphenous vein grafts: Methodological insights from the randomized RRISC trial. # — Paul Vermeersch, Pierfrancesco Agostoni, Oscar Semerano, Glenn Van Langenhove, Stefan Verheye, Paul Van Den Heuvel, Carl Convens, Frank Van Den Braden (*Cardiovascular Institute, Antwerpen, Belgium*).

Background. Angiographic parameters (such as late luminal loss) are common endpoints in drug-eluting stent trials, but their correlation with the neointimal process and their reliability in predicting restenosis are debated.

Methods and Results. Using quantitative coronary angiography (QCA) data (49 bare metal stent and 44 sirolimus-eluting stent lesions) and intravascular ultrasound (IVUS) data (39 bare metal stent and 34 sirolimus-eluting stent lesions) from the randomized Reduction of Restenosis In Saphenous vein grafts with Cypher stent (RRISC) trial, we analyzed the "relocation phenomenon" of QCA-based in-stent minimal luminal diameter (MLD) between post-procedure and follow-up and we correlated QCA-based and IVUS-based restenotic parameters in stented saphenous vein grafts. QCA-based MLD relocation occurred frequently and failed to correlate with in-stent late loss (we expected MLD relocation for low late loss values, as MLD can "migrate" along the stent if minimal re-narrowing occurs, while we anticipated follow-up MLD located close to post-procedural MLD position for higher late loss). Follow up QCA-based and IVUS-based MLD well correlated in the overall population, but QCA underestimated MLD, mainly for lower MLD values. Conversely, the location of QCA-based MLD failed to correlate with the location of IVUS-based MLD. Overall, the ability of QCA in-stent late loss to "predict" IVUS parameters of restenosis (maximum neointimal hyperplasia diameter, neointimal hyperplasia index and maximum neointimal hyperplasia area) was moderate.

Conclusions. These findings suggest the need for a critical re-evaluation of angiographic parameters (such as late loss) as endpoints for drug-eluting stent trials and the use of more precise techniques to describe accurately and properly the restenotic process.

The interventional cardiologist and survivors of out-of-hospital cardiac arrest. Δ — Virginie Guimfacq, Rachid Briki, Jean-Luc Vandenbossche (*CHU Saint-Pierre, Brussels, Belgium*).

Background. Prehospital cardiac arrest is associated with a very poor prognosis. Of all cardiac arrest, 50-70% are caused by acute myocardial infarction. Clinical studies with the use of thrombolysis during cardiac arrest has been limited. Existing data suggest potential beneficial effect of early myocardial reperfusion.

Methods We retrospectively reviewed the characteristics of eighty-five consecutive survivors (male 62; female 23) of out-of-hospital cardiac arrest (OHCA) with no obvious non-cardiac cause of cardiac arrest at admission, in our institution between January 2004 and December 2007.

Results. Coronary angiography was performed in 64 patients. The other 21 patients could not have angiography because of persistent hemodynamic instability.

Forty-eight of the 64 patients had clinically significant coronary disease on angiography, 36 of whom had coronary-artery occlusion (56%). Sixteen patients had no evidence of coronary heart disease. Angioplasty was attempted in 38 patients and was technically successful in 31. Chest pain is not predictive of coronary occlusion. The ST-segment elevation is significantly present in patients with coronaropathy (64% vs. 18%; $p = 0,003$).

The overall survival rate was 49%. Survival was better in patients with normal coronary arteries than in patients with coronaropathy (81% vs. 50%, $p = 0,028$). Multivariate logistic-regression analysis revealed that successful angioplasty was an independent predictor of survival ($p = 0.00021$).

Conclusions. Acute coronary artery occlusion is frequent in survivors of out-of-hospital cardiac arrest. Immediate coronary angiography seems to be associated with an improved outcome.

Cardiovascular nursing

Is preoperative anxiety and depression associated with onset of delirium after cardiac surgery in older patients? A prospective cohort study. # — Elke Detroyer¹, Fabienne Dobbels¹, Els Verfaillie¹, Geert Meyfroidt², Paul Sergeant³, Koen Milisen¹, Koen Milisen⁴ (¹Center for Health Services and Nursing Research, Catholic University Leuven, Leuven, Belgium, ²Surgical Intensive Care Unit, University Hospitals Leuven, Leuven, Belgium, ³Department of Cardiac Surgery, University Hospitals Leuven, Leuven, Belgium, ⁴Department of Geriatrics, University Hospitals Leuven, Leuven, Belgium).

Background. Although numerous studies have already investigated the pre-, intra-, and postoperative risk factors for post-cardiac surgery delirium, the influence of preoperative anxiety and depression on the occurrence of postoperative delirium in cardiac surgery still needs to be determined. Therefore, the aim of the study was to investigate the prevalence of preoperative anxiety and depressive symptoms and their relationship with the occurrence of post-cardiac delirium, and to describe the evolution of these symptoms from preoperative admission until discharge.

Methods. One hundred and four patients (median age = 71; 78.8% men) admitted for elective cardiac surgery to two cardiac surgery units in a university hospital setting were assessed. Anxiety measured with the State-Trait Anxiety Inventory (STAI) and the Hospital Anxiety and Depression Scale (HADS), depression (HADS), cognitive functioning using the

Mini-Mental State Examination, delirium with the Confusion Assessment Method and the Delirium Index, and activity of daily living (Katz) were measured preoperatively. The Mini-Mental State Examination, the Confusion Assessment Method and the Delirium Index were obtained on postoperative day 1, 3 and 7. On day 7 and at discharge the STAI, HADS and Katz were repeated.

Results. Postoperative delirium occurred in 26%. 55.8% reported preoperative state anxiety, 25.2% generalized anxiety and 15.5% depressive symptoms, but no association was found with delirium occurrence. Based on multivariable analysis, a prolonged intubation time (odds ratio = 1.099, confidence interval: 1.047 – 1.153, $P = 0.001$) and a decreased intraoperative lowest body temperature (odds ratio = 0.855, confidence interval: 0.738 – 0.989, $P = 0.03$), were independent predictors of delirium onset. At discharge, 35.7% and 12.2% of patients reported state and generalized anxiety, and 15.3% depressive symptoms.

Conclusions. Despite the high prevalence of preoperative anxiety and depressive symptoms in older patients with cardiac surgery, no association was found with delirium; a syndrome occurring in as much as one in four patients postoperatively.

Cardiac nurses' perception on the role of an advanced practice nursing team in adult congenital heart disease. Δ — Nadia Farroni², Kristien Van Deyk², Evi Pelgrims², Werner Budts², Els Troost², Philip Moons¹ (¹Centre for Health Services and Nursing Research, Katholieke Universiteit, Leuven, Belgium, ²Division of Congenital and Structural Cardiology, University Hospitals Leuven, Leuven, Belgium).

Background. The growing number of adults with congenital heart disease (ACHD) as well as their medical and non-medical problems, require that health care facilities provide appropriate and expert lifetime care for these patients. In response to this, our ACHD programme started in 2000 with the implementation of Advanced Practice Nursing (APN) in ACHD. As the number of patients continued to increase, the APN team grew from 0.2 full-time equivalents (FTE) in 2000 to 1.4 FTE in 2008. Collaboration with bedside nurses of cardiac wards is an absolute necessity for optimal health care provision. The purpose of this study was therefore to explore the experiences and expectations of nurses at the cardiac wards towards the APN team in ACHD.

Methods. The study was conducted in 3 cardiology wards and 1 cardiosurgical ward of a university hospital in Belgium. Overall, 6 focus group interviews were conducted, comprising 5 to 6 nurses in each group. Nurses were asked how they perceived working with the APN team in ACHD. The six competences

as described by the APN framework of Hamric, Spross and Hanson were used to guide the interviews and analyses: 1. coaching and guidance; 2. collaboration; 3. ethical decision-making; 4. clinical and professional leadership; 5. research skills; and 6. consultation.

Results. Coaching/guidance: Ward nurses experience a high level of knowledge in patients who are in regular follow-up at the outpatient clinic. In general, those patients know more about their heart defect than non-specialised cardiac nurses. Collaboration: the APN team also educate in-hospital ACHD patients. Ward nurses do not see this as taking over their responsibilities/activities. On the contrary, this promotes the collaboration and decreases the gap between the different cardiac nursing specialities. Ward nurses expect to be informed about patient education that was given, to allow them to anticipate on further questions. Ethical decision-making: Nurses indicate that they are not frequently exposed to ethical conflicts or dilemmas with ACHD patients, and if it does happen, they refer to someone of the ACHD team. Clinical and professional leadership: Documents developed through the APN team are perceived as very helpful. Consequently, the nurses do not have to ask the same history information again, leading in turn to increased professionalism. Nurses mention that their knowledge of ACHD is limited and they wish to receive more training in this field. Research skills: Nurses are aware that the APN team uses scientific evidence to underpin their practice. Consultation: The APN team is the first resource to consult when nursing problems arise, because the barrier to a congenital cardiologist is bigger.

Conclusions. Bedside cardiac nurses experience that ACHD patients in our hospital are well informed about their condition. Both patients and nurses can consult the APN team if they need more information. However, if an inpatient is educated by the APN team, nurses expect that they are informed about which information is given to the patients. Nurses also recognise their limited knowledge concerning ACHD, but they are prepared to follow further training. Working with documents is helpful to better understand the patient's condition. In general, cardiac nurses in our hospital appreciate the input of and collaboration with the APN team in ACHD.

A disease management program in atrial fibrillation: a guidelines-based, nurse-driven, ICT-supported outpatient clinic. Δ — Jeroen Hendriks¹, Harry Crijns¹, Rianne de Wit², Hubertus Vrijhoef², Robert Tieleman³ (¹University Hospital Maastricht, Maastricht, The Netherlands, ²Maastricht University, Maastricht, The Netherlands, ³Martini Hospital Groningen, Groningen, The Netherlands).

Background. Atrial fibrillation (AF) is associated with doubling of mortality and 10% have suffered a stroke at the very moment the diagnosis AF is made, followed by a 10% yearly stroke rate in high risk patients if left unprotected by oral anticoagulation. Furthermore, quality of life is low in many patients and as a consequence, AF leads to frequent hospitalizations and outpatient consultations. In addition, AF is the most common arrhythmia in the Western world, accounting for approximately one third of hospitalizations for cardiac rhythm disturbances. Yearly, 30,000 patients are admitted for stroke in hospitals in the Netherlands, increasing in prevalence with age. Recent investigations in Europe have demonstrated that cardiologic management of AF patients often does not follow the guidelines and limited adherence to guidelines leads to increased morbidity and mortality in AF patients (Euro Heart Survey, Nieuwlaet et al., 2005). As the number of AF patients is growing, the capacity of health care resources is limited and substitution of care might be part of the solution to further optimize AF practice.

Methods. The AF disease management program consists of a guidelines-based, nurse-driven, ICT-supported outpatient clinic for patients with AF. At baseline and at one year follow-up, all patients fill out an extensive, validated questionnaire evaluating symptoms, socio-demographics, medical history, medication, and cardiovascular risk factors. Patients in the intervention group undergo protocolized laboratory testing, ECG, 24-hour Holter registration and echocardiography. These patients receive care from a specialised nurse who informs the patient about the pathophysiology, consequences and treatment of AF, and pays attention to the patient's lifestyle. The cardiologist meets the patient at the end of the first visit, to confirm the diagnosis and suggested treatment and discuss this with the patient. Furthermore, the nurse uses a dedicated software system, (CardioConsult-AF^R) developed by Dutch experts. This software system is an electronic patient dossier and an expert- or knowledge system, based on the 2006 ACC/AHA/ESC guidelines on AF. The system is able to build an individual risk profile based upon the patients' medical history, questionnaire and additional investigations. Besides this, it makes a proposal for treatment and medication advice. In general, the system guides the nurse through the treatment process according to the evidence based guidelines. Patients randomized to the control group receive care as usual by a cardiologist. The questionnaires are not disclosed to the cardiologist and additional investigation and treatment is left to the treating physician. The cardiologist is not involved in the intervention group. The value of this concept is evaluated in a randomised clinical trial in the Netherlands. It is hypothesized that the treatment of AF patients in the guidelines-based, nurse-driven, ICT-supported disease

management program is efficient and at least as effective as the usual care by a cardiologist in the regular setting. Furthermore, it is calculated that with $\alpha = 0.05$ and a power of 0.80, 349 patients in the control group and 349 patients in the intervention group are needed. Based on the admission rates, this amount of patients can be included in a period of 24 months. Outcomes will be compared for patients treated in the guidelines-based, nurse-driven, ICT-supported outpatient clinic and patients treated in the care as usual by a cardiologist. These analyses will be done using t-test for independent groups for continuous variables and the Fisher exact test for categorical variables. Statistical calculation will be done by using SPSS. Outcomes are defined as: effectiveness and cost-effectiveness of the guidelines-based, nurse-driven, ICT supported disease management program with respect to:

- 1) medical outcomes: a composite endpoint of hospitalisation for any cardiovascular reason and cardiovascular death;
- 2) process outcomes: the extent to which treatment was in accordance to the evidence based guidelines in AF, knowledge and compliance in patients;
- 3) patient outcomes: quality of life (including anxiety and depression) and patient satisfaction;
- 4) cost-effectiveness: the effect (outcome) as well as costs of treatment or intervention in terms of QUALY's

Results. The intervention has potential to decrease cardiovascular complications, to improve quality of life and to improve cost-effectiveness. Results are expected in 2009. The pilot-study (2007) showed improved adherence to the clinical guidelines, leading to significant improvement in the prescription of oral anti-coagulation drugs and diagnostic procedures like measurement of thyroid-stimulating-hormone (TSH) in AF patients.

Conclusions. Taking into account that there is a gap between the guidelines and the current practice, the guidelines-based, nurse-driven, ICT-supported disease management program may contribute to closing the gap between guidelines and current practice in AF.

Improved anti-thrombotic therapy in a guidelines-based, nurse-driven, ICT-supported disease management program for patients in atrial fibrillation. Δ — Jeroen Hendriks¹, Harry Crijns¹, Rianne de Wit², Robby Nieuwlaet¹, Hubertus Vrijhoef², Robert Tieleman³ (¹University Hospital Maastricht, Maastricht, The Netherlands, ²Maastricht University, Maastricht, The Netherlands, ³Martini Hospital Groningen, Groningen, The Netherlands).

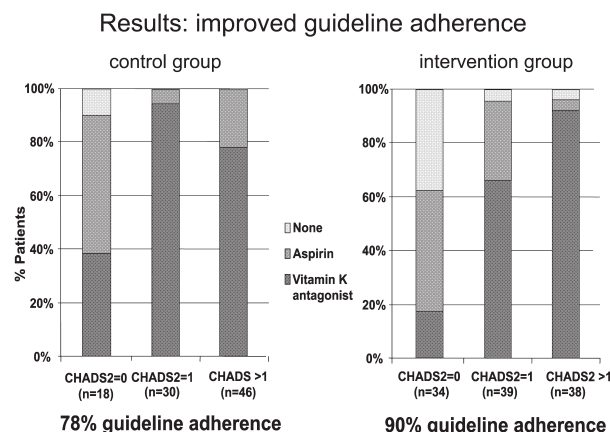
Background. Atrial fibrillation (AF) is the most common arrhythmia in the Western world. The prevalence is 0.4% - 1% in the general population and

increasing with age to 8%. Recent investigations have demonstrated poor guideline adherence in AF patients (Euro Heart Survey, Nieuwlaet et al., EHJ 2005 and 2006). We investigated anti-thrombotic guideline adherence in a specialized AF clinic.

Methods The AF clinic consists of a guidelines-based, nurse-driven, ICT-supported outpatient clinic for AF patients. The care is delivered by specialized nurses who inform the patient about pathophysiology, consequences and proposed treatment of AF, under supervision of a cardiologist. All patients undergo protocolized history taking and investigations according to the 2006 AHA/ACC/ESC guidelines on AF. Data are interpreted by a dedicated software system (CardioConsult-AF^R), which generates a patient profile and suggests evidence-based therapy. We evaluated anti-thrombotic treatment of the first 111 patients in the AF clinic (intervention group) and compared this with a historical control population (n = 102): patients from the same institution who participated in the Euro Heart Survey on AF. The Euro Heart Survey investigated guideline-adherent treatment during 2003 and 2004 across Europe (n = 5,272).

Results. The figure demonstrates improved adherence to the guidelines, with anti-thrombotic treatment according to stroke risk. In the AF clinic, 90% of all patients received guideline adherent anti-thrombotic therapy, compared to 78% of the patients in the Euro Heart Survey ($p < 0.05$).

Conclusions. Protocolized treatment of AF patients in a guidelines-based, nurse-driven, ICT-supported specialized AF clinic may contribute to improved guideline-adherent practice in AF patients.



Advanced practice nurses improve adherence to follow-up: The case of cardiac follow-up in pregnant women with congenital heart disease. Δ — Philip Moons¹, Kristien Van Deyk², Els Troost², Werner Budts² (¹Centre for Health Services and Nursing Research, Leuven, Belgium, ²University Hospitals Leuven, Leuven, Belgium).

Background. Pregnancy in women with congenital heart disease is associated with cardiac and non-cardiac complications. Cardiac complications occur more frequently in women with congenital heart disease than in the general population, i.e. heart failure; arrhythmias; cardiovascular events; and endocarditis. Hence, cardiac follow-up during pregnancy is imperative for women with congenital heart disease. In 2000, our hospital started with Advanced Practice Nurses in adult congenital heart disease. These masters-prepared nurses developed and implemented a structured patient education programme, including information on the impact of pregnancy on the heart and the need for trimestrial follow-up visits with a cardiologist during pregnancy. The aims of the present study were (1) to investigate the prevalence of cardiac follow-up during pregnancy in women with congenital heart disease; and (2) to explore whether Advanced Practice Nurses have an impact on the adherence to cardiac follow-up recommendations.

Methods. This study was a secondary data analysis on data of a descriptive, retrospective study on health behaviour during pregnancy, in which 137 women with congenital heart disease were included. Patients born between January 1, 1958 and December 31, 1983, who had been pregnant for at least 20 weeks and who had their last outpatient visit after January 1, 2000, were eligible for inclusion. Patients with isolated patent foramen ovale, rheumatic heart disease, and mental retardation were excluded. For the purpose of this study, we devised a specific questionnaire that could be administered during a telephone interview.

Results. During their first pregnancy, 56.9% of the patients had follow-up visits with their cardiologist. Before the implementation of Advanced Practice Nursing in our programme, in the year 2000, the proportion of patients who had cardiac follow-up during pregnancy was 44%. This proportion increased up to 71% since the Advanced Practice Nursing team started with systematic educational interventions ($\chi^2 = 9.63$; $P = 0.002$).

Conclusion. This study shows that a considerable number of women with congenital heart disease does not present for cardiac follow-up during pregnancy. However, we found the possible impact of the Advanced Practice Nursing team in pregestational counselling. Indeed, Advanced Practice Nurses in adult congenital heart disease can contribute to a better understanding of the rationale for cardiac appointments during pregnancy and a better adherence with follow-up recommendations.

Gewillig³, Philip Moons³ (¹Centre for Health Services and Nursing Research, Katholieke Universiteit Leuven, Leuven, Belgium, ²Division of Congenital Cardiology, University Hospitals Leuven, Leuven, Belgium, ³Division of Paediatric Cardiology, University Hospitals Leuven, Leuven, Belgium).

Background. Congenital heart disease is associated with malnutrition in childhood, which in turn may lead to a slower development, reduced growth, postoperative complications (pneumonia, infections, difficult wound healing) and muscle atrophy. It is, however, not known to what extent malnutrition in childhood results in long-term consequences. We therefore conducted a proof of concept study to explore whether our research method is feasible to investigate the impact of malnutrition in childhood on the weight and height in adults with congenital heart disease.

Methods. Using a descriptive, retrospective study design, we included patients having one of the following heart defects: atrial septal defect; atrioventricular septal defect; transposition of the great arteries; or univentricular heart. Overall, 147 patients met the inclusion criteria. Clinical and demographic variables were obtained from the patient files. Complete data necessary to evaluate the occurrence of malnutrition was available for only 22 patients. Malnutrition at birth and at childhood age was calculated considering the criteria of Waterlow. In case of acute malnutrition, the outcome must be lower than 90% when multiplying the current weight by hundred and dividing by the P50 of the weight according to the length. Defining chronic malnutrition, the outcome must be lower than 95% when multiplying the current length by 100 and dividing by the P50 of the length according to the age. Weight and height at adult age was expressed as percentiles.

Results. In the sample of 22 patients, 5 children were acutely malnourished at birth. Of the remaining 17 children who were not acutely malnourished at birth, 9 children presented with acute malnutrition of the age of 1 year. The group of patients who were acutely malnourished in childhood had a higher median for weight and height in comparison with the group that was never acutely malnourished. In terms of chronic malnutrition, 1 child of the 22 patients was malnourished. Of the remaining 21 patients, 5 had chronic malnutrition in childhood, while 16 did not. Also in the group of patients who were chronically malnourished in childhood, a higher median for height was found in comparison with the group that was never chronically malnourished. For weight, no difference was found.

Conclusions. This proof of concept study suggests that the methods that were applied in this study are feasible to investigate the consequences of childhood malnutrition on weight and height in adults with congenital heart disease. This design can be used in larger

What are the consequences of childhood malnutrition on weight and height in grown-ups with congenital heart disease: a proof of concept study? Δ — Margo Rogge¹, Kristien Van Deyk², Nadia Farroni², Marc

samples, which allows us to draw firm conclusions on the relationship between malnutrition and its long-term consequences.

Thrombo-embolic events in adults with congenital heart disease: prevalence and characteristics. # — Sanne Thomas¹, Werner Budts², Kristien Van Deyk², Philip Moons¹ (¹*Centre for Health Services and Nursing Research, Leuven, Belgium*, ²*University Hospitals Leuven, Leuven, Belgium*).

Background. Although life expectancy of patients with congenital heart disease has improved dramatically over the past decades, these patients remain prone to complications, such as arrhythmias; heart failure; pulmonary vascular disease; endocarditis; or thrombo-embolism. With respect to thrombo-embolism, no epidemiological data are available in this patient population. The aim of this study was therefore to investigate the prevalence and characteristics of thrombo-embolic events in adults with congenital heart disease.

Methods. We conducted a retrospective review of the computerized database of the congenital heart disease programme in our hospital. Patients were eligible for inclusion in this study if they were 16 years of age or older and if one of the following keywords were found in the patient record: thrombo*; embo*; infarction; CVA; TIA; RIND; pulmonary embolism; transcience; and septic embolism. If such an event was recorded in the database, the full medical record of this patient was reviewed. Nominal data were expressed as percentages. Relative risk (RR) and 95% confidence intervals were calculated. Kaplan-Meier curves were plotted to estimate the actuarial survival after a thrombo-embolic event.

Results. In the database, 9236 patients aged 16 years or older were screened. Overall, 265 thrombo-embolic events occurred in 191 patients, representing a prevalence of 2.1%. The most frequently occurring events were stroke (33.2%); transient ischemic accident (18.5%); venous thrombosis (12.8%); arterial thrombosis (9.8%); and septic embolism (6%). Anomalies that were associated with a significantly higher risk for thrombo-embolic events were: Eisenmenger syndrome (50%; RR 25.46 [16.05-40.38]); Ebstein anomaly (14.8%; RR 7.44 [4-13.83]); transposition of the great arteries (5%; RR 2.55 [1.5-4.33]); tetralogy of Fallot (4.4%; RR 2.34 [1.6-3.43]); univentricular physiology (3.6%; RR 1.81 [1.06-3.09]); and atrial septal defects (3.1%; RR 1.71 [1.24-2.35]). Recurrence of thrombo-embolism was observed in 25.1% of the patients after a median of 1.1 (0.4-5.1) years. Actuarial survival at 10, 20, and 30 years after the first thrombo-embolism was 93.7%, 89.5%, and 89%.

Conclusion. This is to our knowledge the first study collecting epidemiological data on thrombo-embolic

events in a large cohort of adults with various types of congenital heart disease. Thrombo-embolism occurred in 1 per 50 patients. Heart defects that are associated with a higher risk for thrombo-embolism were identified.

What does a patient with a mechanical heart valve know about oral anticoagulants and does he adhere to the treatment? # — Sara Van Damme¹, Kristien Van Deyk¹, Philip Moons², Peter Verhamme¹, Werner Budts¹ (¹*Division of Cardiology, University Hospitals Leuven, Leuven, Belgium*, ²*Centre for Health Services and Nursing Research, Katholieke Universiteit Leuven, Leuven, Belgium*).

Background. Lifelong treatment with oral anticoagulants is needed in patients with one or more mechanical heart valves. This treatment is often very complex. Incorrect use of the medication can lead to severe complications such as massive bleedings or thrombo-embolisms. To prevent these complications, patients are required to have adequate knowledge and should adhere to the prescribed medication regime. The goal of this study is to measure the level of knowledge and adherence with respect to oral anticoagulants in patients with a mechanical heart valve because of congenital heart disease or acquired valve defects.

Methods. In this descriptive, cross-sectional study, patients could be included if they were older than 18 years, were able to read Dutch, received oral anticoagulants for an indefinite period and were not mentally retarded. We included 57 patients, 28 of which had congenital heart disease and 33 had acquired valve defects. The sample consisted of 35 men and 22 women. The median age was 60 years. After a review of the literature, a new questionnaire was developed comprising 10 multiple choice questions concerning knowledge and three questions concerning adherence. Content validity of the questionnaire was evaluated using an expert panel and a test sample of three patients.

Results. The patients had good knowledge (> 80% correct answers) about the name of the blood test that measures the adequacy of anticoagulation; the reason for taking anticoagulating drugs; the risks when the patient skipped a dose of medication; and the need to stop the intake of the medication in case of surgery. Patients were moderately knowledgeable (50-80% correct answers) about suitable medication in case of headache; which sport activities should be avoided; and which actions should be taken if the intake of a dose of medication would be missed. There was a poor understanding (< 50% correct answers) of symptoms relevant to overanticoagulation; and of the effect of alcohol and/or vitamin preparations on oral anticoagulants. Patients with congenital heart disease or

acquired valve defects did not differ in the level of knowledge. Three quarters of the patients claimed to be 100% adherent to the oral anticoagulant therapy. Approximately one fifth of the patients indicates to have missed one dose of the medication over the past month (14.3%), fifteen days (7.1%) or week (3.6%).

Conclusions. Inadequate knowledge and medication adherence yield an increased risk for complica-

tions in patients on oral anticoagulation therapy. This study suggests that there are gaps in the level of knowledge of these patients, one fourth (25%) of the patients admitted not to be fully adherent to the therapy. Hence, there is room for structured educational interventions in the interdisciplinary care for patients with mechanical heart valves. Nurses can play a pivotal role in developing such an education programme.