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Jahrestagung der Österreichischen Kardiologischen Gesellschaft 7. bis 10. Juni 2006, Salzburg Abstracts

VORTRÄGE

Donnerstag, 8. Juni 2006, 16–17.30 Uhr

Freie Vorträge I – Best Abstracts

Impact of Specialised Heart Failure Outpatient Units on the Prevalence of Hospitalisations Due to Congestive Heart Failure in Different Regions of Austria 091

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Background and Aim Heart failure (HF) is one of the most important reasons for hospitalisation. Chronic HF patients (pts) characteristically present with multiple re-admissions for acute decompensation and represent a major burden on national health-care costs. Special care, in form of HF-outpatient units have been organised and their impact on the decrease of recurrent hospital readmissions was investigated.

Methods Data from the Austrian Department for Statistics 2000 and 2004 concerning pts admitted to a hospital in Austria because of acutely decompensated HF (based on the ICD-10 Code) with focus on regional differences were investigated.

Results 31,243 consecutive pts with congestive HF (CHF) were registered in the year 2000 compared to 26,030 pts in 2004 resulting in a total decline of 5213 pts (17 %). The regional changes between 2000 and 2004 are demonstrated in **Figure 1**. A decline in hospitalisations (hosps) due to HF between 4–47 % could be demonstrated in 8 out of 9 regions of Austria, while only one region in Austria showed an increase of hosps (21 %). Two regions showed a dramatic decrease (28 and 47 %), while in 6 regions a moderate reduction of hosps was seen (4–10 %). The distribution of HF services in relation to the number of inhabitants are given in **Figure 2**.

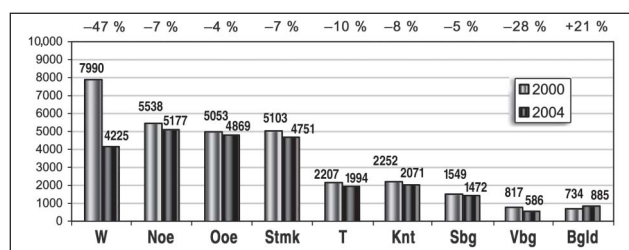


Figure 1: I. Kozanli et al.

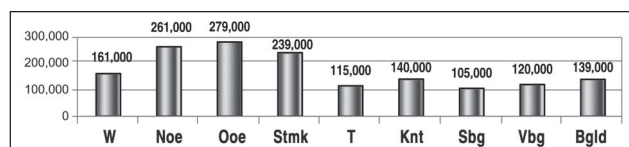


Figure 2: I. Kozanli et al.

Conclusion A decline of hosps due to HF was observed in all but one regions in Austria. The prominent decrease of HF admissions in Vienna might be explained not only by the organisation of special care outpatient wards but also by a pilot project providing home nurse care which was performed in the years 2002–2004, while the wide range of inhabitant numbers/special HF care unit (105,000 to 279,000) had no influence on the quality of care. The installation of specialised HF services all over the country equipped with specially trained HF nurses and new strategies of care (home nursing) are important contributions to increased quality care of chronic HF pts ending up in a lower re-hospitalisation rate.

The -11377 C > G Promoter Variant of the Adiponectin Gene Predicts Vascular Events in Male Coronary Patients 023

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Background Low serum levels of the adipocyte-derived peptide adiponectin are associated with obesity, type 2 diabetes, and cardiovascular disease. The -11377 C > G promoter variant of the adiponectin gene recently has been linked to decreased adiponectin levels. No prospective data demonstrating an increased cardiovascular risk in individuals with the G versus the C allele are available.

Methods In a consecutive series of 402 men who had undergone coronary angiography for the evaluation of coronary artery disease, vascular events were recorded over 4.1 ± 0.4 years.

Results The prevalence rates of the -11377 CC, GC, and GG genotypes among our patients were 56.5 %, 37.1 % and 6.5 %, respectively. At baseline, serum adiponectin levels decreased significantly from the CC over the GC to the GG genotype (p for trend = 0.003), and the prevalence of significant coronary stenoses ≥ 50 % increased gradually from the CC over the GC to the GG genotype (63.9 %, 73.2 %, and 88.5 %, respectively; p for trend = 0.004). Prospectively, the presence of the G allele of the adiponectin gene -11377 C > G polymorphism strongly and significantly predicted future vascular events (adjusted hazard ratio = 1.703 [1.074–2.699]; p = 0.023). Adjusted hazard ratios were 1.582 [0.971–2.577] and 2.403 [1.108–5.214] for patients with the CG and GG genotypes when compared to patients with the CC genotype (p for trend = 0.011).

Conclusions Among male coronary patients the -11377 C > G promoter variant of the adiponectin gene is i) associated with decreased serum adiponectin levels, ii) correlated with an increased prevalence of significant coronary stenoses and iii) strongly predictive of future vascular events.

Septale versus apikale Stimulation bei Patienten mit permanentem AV-Block – eine randomisierte Untersuchung

004

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Einleitung In verschiedenen Studien konnte gezeigt werden, daß durch die rechtsapikale Stimulation eine asynchrone ventrikuläre Erregung verursacht wird, welche wiederum mit einer Beeinträchtigung der Pumpfunktion des Herzens einhergeht. Unsere Hypothese bestand darin, daß die negativen Auswirkungen der permanenten ventrikulären Stimulation unter septaler Stimulation geringer als unter apikaler Stimulation sind. Das Ziel unserer Untersuchung war es daher, verschiedene Schlüsselparameter zur Beurteilung der Pumpfunktion unter rechtsseptaler Stimulation im Vergleich zur derzeit etablierten rechtsapikalen Stimulation zu beobachten.

Methoden und Ergebnisse Es wurden 85 Patienten (P) mit totalem atrioventrikulärem Block entweder zur apikalen (n = 39) oder zur septalen (n = 46) Stimulation randomisiert. Für die septale Positionierung wurden Schraubsonden, für die apikale Position Ankersonden der gleichen Herstellerfirma verwendet. Bei allen P wurde ein echokardiographisches Protokoll, eine Fahrradergometrie sowie pBNP-Plasmaspiegel drei Tage und drei Monate nach Implantation durchgeführt. Die Ejektionsfraktion (EF) nach Implantation in der septalen (S) Gruppe betrug $54 \pm 14\%$ und $57 \pm 14\%$ in der apikalen (A) Gruppe. Nach drei Monaten permanenter Stimulation war die EF in der S-Gruppe gering höher als in der A-Gruppe ($56 \pm 14\%$ vs. $54 \pm 13\%$, p = n. s.). Die maximale Ergometerleistung betrug anfangs 93 ± 45 Watt (W) in der S-Gruppe vs. 88 ± 39 W in der A-Gruppe. Drei Monate später war die Leistungsfähigkeit in beiden Gruppen etwa gleich (91 ± 39 W in S vs. 93 ± 41 W in A, p = n. s.). Die pBNP-Spiegel betrugen anfangs 834 ± 730 pg/ml in der S-Gruppe und 1378 ± 1693 pg/ml in der A-Gruppe (p = n. s.). Nach drei Monaten sanken die pBNP-Werte in beiden Gruppen auf 604 ± 723 pg/ml in S vs. 834 ± 1009 pg/ml in A (p = n. s.). Die Implantationszeit betrug in der S-Gruppe 45 ± 4 Minuten und in der A-Gruppe 51 ± 5 Minuten (p = n. s.). Vier P der A-Gruppe und drei der S-Gruppe verstarben im Nachbeobachtungszeitraum (p = n. s.). In jeder Gruppe verstarb je ein P an Pumpversagen, ein P jeder Gruppe mußte aufgrund von Herzinsuffizienz auf ein biventrikuläres System aufgerüstet werden.

Schlußfolgerung Die septale Sondenposition ist eine technisch machbare und sichere Alternative zur apikalen Lage. Es wurden keine Nachteile gegenüber der herkömmlichen apikalen Lage beobachtet. Nach drei Monaten permanenter rechtsventrikulärer Stimulation konnten keine signifikanten Vorteile des S- gegenüber dem A-Stimulationsort in Bezug auf die EF, die Leistungsfähigkeit sowie auf den pBNP-Verlauf gefunden werden.

Head-to-Head Comparison of B-type Natriuretic Peptide and N-terminal proB-type Natriuretic Peptide under "Real World" Conditions

008

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Objective B-type natriuretic peptide (BNP) and N-terminal- (NT-) proBNP have been proposed as laboratory markers for the diagnosis of heart failure. The aim of this study was to compare both markers under "real world" conditions in 500 consecutive samples sent from our Department of Internal Medicine for NT-proBNP measurement, and to investigate influences on both markers.

Methods Only one sample from each patient was included in the analysis, and the final study population comprised of 458 patients (mean age 60 years $\pm$ 16 years; 159 female, 299 male). Patients suffered from cardiac diseases with (n = 81) and without reduced ejection fraction (n = 317), renal dysfunction as defined as glomerular filtration rate < 60 ml/min/1.73 m² (n = 104), hypertension (n = 226) or anaemia (n = 53). BNP was measured by the Abbott assay on the AxSYM analyser and NT-proBNP by the Roche assay on the E170 analyser.

Results We found a significant increase of BNP and NT-proBNP values in patients with reduced systolic left ventricular function. Values were not significantly increased in patients with other cardiac diseases with normal systolic function compared to patients without cardiac diseases. Linear regression analysis revealed a significant influence of reduced ejection fraction, renal dysfunction, anaemia, hypertension and age on both BNP and NT-proBNP values. BNP and NT-proBNP showed a close correlation of $r = 0.885$ (p < 0.01) with each other. Using age and gender adjusted normal values the inter-rater reliability of the two parameters was assessed using Cohen's Kappa test. The Kappa of 0.7 indicated a satisfactory agreement between both markers. 376 measurements (82 % of total population) revealed concordant BNP and NT-proBNP results. Both tests were positive in 185 patients and both test results were negative in 191 patients. Discordant results comprised 77 patients (16 % of the total population). The combination of normal BNP and elevated NT-proBNP was significantly more frequent than vice versa. In the group with normal BNP and elevated NT-proBNP (n = 61) an impaired cardiac function was diagnosed in only 7 patients, 24 patients had renal failure.

Conclusion Our results demonstrate that BNP and NT-proBNP are frequently elevated in the absence of systolic left ventricular dysfunction. Using age and gender adjusted normal values renal failure is one of the most common reasons for false positive results. The agreement between both markers is satisfactory despite discrepancies, which demonstrates that both markers are not completely equivalent.

Diabetes mellitus und koronare Herzkrankheit: anti-inflammatorische Wirkung einer multifaktoriellen Intervention

065

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Bei Diabetes mellitus findet sich eine akzelerierte Form der Atherosklerose, die mit einer Erhöhung inflammatorischer Marker assoziiert ist. Ziel der Studie war eine Verbesserung des kardialen Risikoprofils durch intensivisierte, multifaktorielle Intervention und deren Wirkung sowohl auf zellständige und lösliche Adhäsionsmoleküle im Serum als auch in der Skelettmuskulatur.

23 Patienten mit Diabetes mellitus Typ 2 und koronarer Herzkrankheit wurden in 2 Gruppen randomisiert: Intervention (I): 6 $\times$ tgl. je 15 min Ergometertraining, Diätschulung, angepasste Diabetikerkost, optimierte medikamentöse Therapie; Kontrollgruppe (K): Behandlung nach geltenden Empfehlungen, Betreuung durch den Hausarzt. Der Einfluß der Intervention wurde nach 4wöchiger Dauer kontrolliert und mit den Ergebnissen der Kontrollgruppe verglichen. Untersuchung folgender Parameter: Serummarker (hs-CRP, ICAM, IL-6) mittels ELISA, mononukleäre Adhäsionsmoleküle (MAC1, VLA-4) mittels FACS und mRNA von Hämoxxygenase 1 (Schutz vor oxidativem Streß) im Skelettmuskel mittels Light Cycler.

Bei I wurden folgende signifikante Veränderungen beobachtet: Abnahme des Körpergewichts um 5,3 %, des Body-Mass-Index um 7,3 % (I: $-6,0 \pm 1,1$ vs. K: $+1,3 \pm 0,1$ kg; p < 0,001; I: $-1,7 \pm 0,1$ vs. K: $1,1 \pm 0,7$; p < 0,002), Zunahme der körperlichen Belastbarkeit um 25 % (I: 36 ± 8 vs. K: 4 ± 1 Watt; p = 0,0004), weiterhin Senkung von hsCRP (I: $1,4 \pm 1,6$ vs. K: $5,3 \pm 4,7$; p = 0,03), MAC-1 (I: 38.808 ± 11.345 vs. K: 27.490 ± 7738 ; p < 0,05) und VLA-4 (I: 8823 ± 2795 vs. K: 7978 ± 2517 ; p < 0,05). Im Vergleich zur Erstuntersuchung (A) zeigte sich nach 4 Wochen (B) bei I eine Abnahme von ICAM um 13 % (A: 154.647 ± 46.411 vs. B: 133.961 ± 40.519 ; p = 0,038), Interleukin 6 um 39 % (A: $4,6 \pm 2,6$ vs. B: $2,5 \pm 1,2$; p = 0,13) und ein Anstieg der Hämoxxygenase 1 von $3,0 \pm 3,2$ auf $5,4 \pm 3,4$ (p = 0,04). Bei K gab es keine signifikanten Veränderungen.

Eine 4wöchige Intervention, bestehend aus intensivem körperlichem Training, intensiver Diätschulung und optimierter Medikation, führt zu einer effektiven Verbesserung des kardialen Risikoprofils und der diabetischen Stoffwechsellage im Serum und in der Skelettmuskulatur.

Plasma NT-proBNP and Interleukin-6 Levels Show Gender-Specific Differences in Predicting Mortality Among Patients with Cardiogenic Shock 093

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Introduction High plasma levels of interleukin-6 (IL-6) have shown to be associated with progression of organ failure and 30-days outcome of patients with cardiogenic shock (CS). NT-proBNP levels are early markers of outcome in patients with severe sepsis, but little is known about the prognostic significance of this peptide in patients with CS. Therefore, the aim of the present study was to evaluate prognostic significance of NT-proBNP in CS and to investigate whether combined measurement with IL-6 might help to stratify risk of patients with CS.

Methods Plasma levels of NT-proBNP (Roche Diagnostics, Austria) were determined in blood samples of 48 patients with CS collected at admission to the coronary care unit.

Results According to ROC analyses IL-6 > 200 pg/ml and NT-proBNP > 12,579 pg/ml levels had the strongest predictive value of 30 days mortality. In multivariate Cox regression analysis IL-6 and NT-proBNP levels were significant predictors of 30-days mortality independent of renal function as well as of clinical, haemodynamical and laboratory parameters ($p = 0.007$ and $p = 0.001$; respectively). Further analyses revealed that among female patients NT-proBNP but not IL-6 had significant prognostic power ($p = 0.03$ and $p = 0.45$, respectively), while among male patients IL-6 was significantly associated with 30-days mortality ($p = 0.001$ for IL-6 and $p = 0.09$ for NT-proBNP, respectively). Using both markers simultaneously could substantially improve the assessment of survival both among female as well as male patients.

Conclusion NT-proBNP and IL-6 levels are strong and independent predictors of outcome in patients with CS but might have different prognostic role among male and female subjects. Therefore, simultaneous measurements of these markers in the intensive care unit might be appropriate for early risk stratification in CS.

Rate and Predictors of In-Stent Restenosis by Use of 3 Different Drug-Eluting-Stents: a Single Center Experience 103

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Objectives The aim of the study was to investigate the rate and predictors of in-stent restenosis by use of 3 different drug-eluting stents: JANUS®, TAXUS® and CYPHER® in 165 consecutive patients undergoing coronary artery stenting.

Background In-stent neointimal proliferation represents the persisting limitation and challenge of coronary stenting but has been reduced with the use of drug-eluting stents (DES). Drug delivering stents serve as a reservoir for local drug administration and are in immediate contact with the coronary artery wall, thus ensuring maximum delivery of the pharmacological agent. The JANUS® (Tacrolimus-eluting CarboStent), the CYPHER® (Sirolimus-eluting stent) and the TAXUS® (paclitaxel-eluting stent) have shown favourable clinical data and provide an entirely new spectrum of potential therapies for restenosis.

Methods and Study Population This is a prospective study. The effect of DES was studied in 165 consecutive patients undergoing coronary artery stenting, of which 61 patients (65 lesions with 76 CYPHER® stents) were in CYPHER® group, 65 patients (77 lesions with 87 TAXUS® stents) were in TAXUS® group and 39 patients (42 lesions with 48 JANUS® stents) were in JANUS® group.

Results Rates of in-stent restenosis during a 12 month follow-up were 3 % in the CYPHER® stent group, 2 % in the TAXUS® stent group and 21 % in the JANUS® stent group (TAXUS® vs. JANUS®,

$p = 0.0002$; CYPHER® vs. JANUS®, $p = 0.0007$), respectively. Restenosis became clinically evident after 5 month (JANUS® group) and 8 month (CYPHER® and TAXUS® group) on average. There was no significant difference in clinical data between groups. Stent length was found to be a significant predictor of in-stent restenosis in the JANUS® stent group (23 ± 1.7 mm vs. 18 ± 0.9 mm; $p = 0.01$). In addition, in the JANUS® group, restenosis appeared more frequently in the RCA (JANUS® vs. TAXUS® and CYPHER®; $p = 0.003$) and in the CX ($p = 0.04$). There was statistical significant difference in ACC/AHA lesion types: Type C ($p = 0.03$) and B2 ($p = 0.06$) developed more frequently restenosis in the JANUS® stent group in comparison with two others groups. Interestingly, GFR was higher in the restenosis group independent of used DES. Stent length, stent diameter and number of implanted stents had no significance in comparison of groups.

Conclusions There was a higher tendency in the restenosis rate in the JANUS® stent group as compared with two other groups. Stent length and culprit lesion in the RCA and CX® were predictive factors for in-stent restenosis in patients receiving JANUS® stents. The different results might be influenced by chance based on the low patient number investigated but confirm the excellent performance of TAXUS® and CYPHER® stents.

Freie Vorträge I – Best Abstracts 2

BNP Is a Predictor in Low Flow Aortic Stenosis: Results from the Multicenter TOPAS Study 052

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Background B-type natriuretic peptide (BNP) has been studied in aortic stenosis (AS), but no data have been reported for patients with low-flow, low-gradient AS. Therefore, we studied the relationship of BNP and NT-proBNP with rest and stress haemodynamics, as well as clinical outcome in this group.

Methods Plasma BNP and NT-proBNP were measured in 78 pts with AS undergoing dobutamine stress echocardiography (DSE). Sixty nine pts had low-flow AS (indexed effective orifice area [EOA] < $0.6 \text{ cm}^2/\text{m}^2$, mean gradient [MG] < 40 mmHg, LV ejection fraction [EF] ≤ 0.40). Nine pts with AS and normal EF served as controls. Pts were classified as truly severe [TS] or pseudosevere AS [PS] based on DSE findings (projected EOA at a normal flow rate of $250 \text{ mL/s} \leq$ or $> 1.0 \text{ cm}^2$) as previously proposed in the TOPAS study.

Results BNP and NT-proBNP were markedly elevated in low-flow AS (BNP 890 ± 1105 vs. controls $190 \pm 183 \text{ pg/mL}$; $p = 0.001$; NT-proBNP $6131 \pm 12,213$ vs. $193 \pm 199 \text{ pg/mL}$; $p = 0.006$), but varied widely. BNP was inversely related to EF at rest ($r = -0.587$; $p < 0.0001$) and peak stress ($r = -0.508$; $p < 0.0001$), as well as to EOA at rest ($r = -0.497$; $p < 0.0001$) and peak stress ($r = -0.456$; $p < 0.0001$), stroke volume (BNP, $r = -0.333$; $p = 0.006$), mean transvalvular flow rate ($r = -0.313$; $p = 0.01$) and positively to valvular resistance ($r = 0.416$; $p = 0.0006$) and wall motion score index ($r = 0.359$; $p = 0.0035$). Similar findings were observed for NT-proBNP. BNP was significantly higher in 29 TS compared to 40 PS pts (1081 ± 1159 vs. $685 \pm 850 \text{ pg/mL}$; $p = 0.008$). Similarly, BNP was higher in 25 vs. 44 pts with a peak stress EOA $\leq$ or $> 1.0 \text{ cm}^2$ (1392 ± 1413 vs. $543 \pm 459 \text{ pg/mL}$; $p = 0.0002$). In the subgroup of 29 patients who underwent aortic valve replacement, BNP tended to be higher in 9 pts who died postoperatively compared to 20 pts surviving valve replacement (BNP 1605 ± 1873 vs. $737 \pm 493 \text{ pg/mL}$, n. s.). In the total cohort, cumulative 1 year survival of pts with BNP $\geq 550 \text{ pg/mL}$ was significantly lower than of pts with BNP < 550 ($47 \pm 9 \%$ vs. $97 \pm 3 \%$; $p = 0.0001$), independently of gender. Postop-

erative survival was significantly lower in patients with BNP ≥ 550 vs. < 550 pg/mL at 1 year ($53 \pm 13\%$ vs. $92 \pm 7\%$; $p = 0.02$).

Conclusion In pts with low-flow AS, BNP and NT-proBNP are markedly elevated and related to EF and EOA at rest and peak DSE. BNP is higher in truly severe compared to pseudosevere AS. Overall one year survival is poor in pts with BNP ≥ 550 , but reasonable in pts with BNP < 550 pg/mL.

Risk Factor Stratification in Patients with Asymptomatic Aortic Stenosis

015

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Background Aim of the study was to evaluate established and possible risk factors for adverse short-term clinical outcome in patients with asymptomatic, degenerative aortic stenosis.

Methods 34 consecutive patients with asymptomatic aortic stenosis were examined prospectively concerning aortic valve calcium score as quantified with multislice CT, echocardiographic parameters (aortic valve area calculated assessed by continuity equation, mean and maximal transvalvular pressure gradients, enddiastolic septal wall diameter) and laboratory tests (NT-proBNP, CRP).

Results Within 18–24 months of follow-up, 11 out of 34 (32 %) patients developed a major adverse clinical outcome, reflecting the overall poor prognosis of asymptomatic aortic stenosis: Ten patients suffered from onset of symptoms accompanied by haemodynamic progression and one patient died of sudden cardiac death. Six of 10 patients underwent aortic valve replacement, one patient denied operation, three patients were not accepted for surgery and one of them died of sudden death soon afterwards. The aortic valve calcium score was the strongest predictor of a major adverse clinical event (5111 ± 2409 vs. 1928 ± 789 ; $p < 0.001$), and plasma levels of NT-proBNP (1518 ± 1509 vs. 240 ± 207 ng/L, $p = 0.003$), the mean transvalvular pressure gradient (36 ± 8 vs. 26 ± 8 mmHg, $p = 0.002$) and AVA (0.74 ± 0.10 , 0.92 ± 0.20 cm², $p = 0.003$) were also significant risk factors for adverse clinical outcome.

Conclusion In addition to well established haemodynamic parameters, both aortic valve calcium score as quantified with multislice CT and plasma levels of NT-proBNP highly predict adverse short term clinical outcome in patients with asymptomatic aortic stenosis. In patients with severe aortic valve calcification and high NT-proBNP plasma levels, close follow-up examinations are mandatory and early elective surgery may be considered even in the absence of overt symptoms.

Evaluation of Robotic Coronary Surgery by Intraoperative Angiography in Combination with Postoperative Multislice Computer Tomography

035

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Objective Robotically assisted coronary artery surgery, in particular total endoscopic coronary bypass surgery (TECAB), is an innovative minimal invasive procedure requiring proof of immediate and short term patency of grafts to compete with conventional bypass surgery or percutaneous coronary interventions.

Methods In 53 patients after robotic coronary surgery (31 arrested heart TECAB, 20 via sternotomy robotically assisted anastomoses, 2 beating heart TECAB) intraoperative coronary angiography was performed with a mobile C-arm (OEC 9800, GE Healthcare). Within 3 months after surgery, all patients underwent 16 row ECG gated multislice computer tomographic angiography (MSCTA, Sensation 16™, Siemens Medical Systems, Erlangen) and invasive coronary angiography follow-up.

Results 51/53 bypass grafts could be visualised by intraoperative coronary angiography. Spasm of target vessels and/or bypass grafts (reversible after intraluminal nitroglycerine application) could be observed in 40 %. In 6 pts immediate surgical revision due to stenotic/occluded target vessel segments or anastomotic bleeding was required. No angiography related complications occurred. Follow-up MSCTA and correlation to invasive catheterisation showed patent grafts in all patients investigated. MSCTA image quality of proximal bypass anastomoses was judged excellent, scanning quality of distal anastomoses was of lower quality, but still sufficient to judge patency.

Conclusion The combination of intraoperative angiography and follow-up MSCTA allows safe and high quality evaluation of immediate and short term outcome in innovative robotic coronary surgery.

Beneficial Effect of Combined (Intramyocardial and Intracoronary) Bone Marrow-Derived Stem Cells Therapy in Patients with Ischaemic Heart Disease and Severely Depressed Left Ventricular Function

087

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Background Implantation of bone marrow-derived stem cells (BM-SCs) into the failing heart may be a promising approach for cardiac regeneration in heart failure secondary to severe coronary artery disease.

Aim The aim of the present study was to determine the effects of the combined (intramyocardial and intracoronary) percutaneous administration of non-selected BM-SCs therapy on the size of ischaemia, the clinical status and left ventricular function in no option patients with chronic myocardial ischaemia and severely depressed left ventricular function.

Methods Eighteen patients (94 % men, mean age: 55.4 ± 10.5 years) with previous myocardial infarction and left ventricular ejection fraction less than 35 % under optimal medical treatment received combined (NOGA-guided intramyocardial [4.0 ± 0.6 ml] plus intracoronary [30.2 ± 13.8 ml]) autologous BM-SCs therapy (total cell number: $2.82 \times 10^9 \pm 3.39 \times 10^9$; CD34⁺ cell number: $4.60 \times 10^7 \pm 4.41 \times 10^7$). Baseline and 6-month follow-up 99m-Tc-MIBI-adenosin-perfusion scintigraphy for determination of size of resting and stress-induced perfusion defects, NOGA endocardial mapping for assessment of myocardial viability, contrast ventriculography for calculating of global left ventricular ejection fraction (EF), left ventricular end-systolic (ESV) and end-diastolic volume (EDV) were performed in all patients.

Results A positive trend to smaller stress-induced perfusion defects (from $37.3 \pm 12.0\%$ to $32.9 \pm 11.6\%$; $p = 0.07$) and significant increase in mean unipolar voltage value of injected area measured by NOGA endocardial mapping (from 7.24 ± 2.33 mV to 8.43 ± 2.70 mV; $p = 0.007$) (normal value > 14 mV) was observed after 6-month combined application form of BM-SCs therapy. Accordingly, the clinical status of patients improved (NYHA functional class from 2.69 ± 0.96 to 1.74 ± 0.95 ; $p = 0.001$, CCS from 2.31 ± 1.10 to 1.43 ± 0.79 ; $p = 0.04$), the global left ventricular ejection fraction increased (from $32.9 \pm 5.4\%$ to $41.0 \pm 8.2\%$; $p = 0.01$) and ESV decreased (from 153.9 ± 37.6 ml to 145.7 ± 57.0 ml; $p = 0.05$), significantly. In addition to that a significant decrease in heart rate (from 76.7 ± 15.7 bpm to 64.5 ± 11.0 bpm; $p = 0.005$) could be observed without any significant change of drug therapy.

Conclusion Combined (intramyocardial and intracoronary) BM-SCs implantation induces reduction of the size of chronic ischaemia, significant improvement of clinical status and left ventricular function as well as the further decrease of the elevated sympathetic activation in patients with ischaemic heart disease and severely depressed left ventricular function.

Behandlung von Aortenbogenaneurysmen durch Umbau des Aortenbogens mit konsekutiver Stentgraftinsertion

082

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Hintergrund Ziel dieser klinischen Untersuchung war es, Machbarkeit und Effektivität eines kombinierten Verfahrens zur Behandlung von Aortenbogenaneurysmen durch den Umbau des Aortenbogens mit konsekutiver Stentgraftinsertion in den Bogen zu evaluieren.

Methodik In der Zeit von Oktober 2002 bis Jänner 2006 haben wir 19 Patienten (medianes Alter 79,5 a) mit Aortenbogenaneurysmen, die den Abgang der linken Arteria carotis communis miteingeschlossen haben, behandelt. Das Konzept bestand aus der Transposition der supraaortalen Äste, um einen proximalen Hals für die Stentgraftinsertion schaffen zu können. Bei 13 Patienten erfolgte der Bogenumbau autolog ohne Verwendung alloplastischen Gefäßersatzmaterials.

Ergebnisse Zwei Patienten sind während des Spitalsaufenthaltes verstorben (1 Patient an einer Ruptur 2 Tage nach Bogenumbau, der zweite an einem Myokardinfarkt am Tag vor der Entlassung). Bei zwei Patienten hat sich ein frühes Typ-I-Endoleak gezeigt. Nach jeweils einer Woche kam es in beiden Fällen zum spontanen Verschluss. Bei einem Patienten erfolgte 23 Monate nach Erstimplantation eine erneute Stentgraftinsertion bei einem Typ-III-Endoleak, die erfolgreich verlaufen ist. Der durchschnittliche Nachbeobachtungszeitraum betrug 20 Monate. Alle supraaortalen Rekonstruktionen waren frei durchgängig und es ließ sich bei den übrigen Patienten kein Endoleak nachweisen.

Schlussfolgerungen Ein kombiniertes Verfahren zur Behandlung von Aortenbogenaneurysmen durch den Umbau des Aortenbogens mit konsekutiver Stentgraftinsertion in den Bogen ist machbar und effektiv. Eine erweiterte Anwendung dieser Technik wird die Therapie einer selektionierten Subgruppe von Patienten ermöglichen, die für eine konventionelle Operation in tiefer Hypothermie und Kreislaufstillstand nicht geeignet sind.

Left Atrial Size Independently Predicts Outcome in Asymptomatic Severe Mitral Regurgitation

098

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Background Left atrial (LA) size is affected by left ventricular (LV) diastolic pressure, the degree of ventricular remodelling, the occurrence of atrial fibrillation and the presence of mitral regurgitation (MR) itself. LA size has been proposed to be a predictor of outcome after mitral valve replacement with preserved LV function. However, the predictive value of LA size for development of symptoms or LV dysfunction among pts with severe MR has not been studied.

Methods 132 consecutive asymptomatic pts (age 55 ± 15 yrs, 49 female) with severe degenerative MR and normal LV function were prospectively followed for a median of 69 months. Pts underwent serial clinical and echocardiographic exams. The following potential predictors of outcome were studied: LA size, endsystolic and enddiastolic LV diameter, pulmonary artery pressure and clinical risk factors.

Results Kaplan-Meier event-free survival for the entire pt group, with endpoints defined as development of symptoms or LV dysfunction ($n = 38$) and death related to MR ($n = 0$) was $92 \pm 2\%$ at 2 yrs, $78 \pm 4\%$ at 4 yrs, $65 \pm 5\%$ at 6 yrs and $55 \pm 6\%$ at 8 yrs. LA size was the strongest independent predictor of outcome: No events were observed in the group with a LA < 50 mm. Event-free survival for patients with LA 50 to 69 mm was $94 \pm 3\%$ at 2 yrs, 82

$\pm 5\%$ at 4 and $51 \pm 8\%$ at 8 yrs vs. $85 \pm 8\%$ at 2 yrs, $47 \pm 12\%$ at 4 yrs and $40 \pm 12\%$ at 8 yrs for patients with a LA ≥ 70 mm ($p = 0.0001$). None of the other studied parameters reached significance as predictors of outcome in multivariate analysis.

Conclusion LA size is a strong and independent predictor of outcome in patients with asymptomatic severe MR. Patients can be stratified by LA size in groups at low, intermediate and high risk for subsequent symptom or LV dysfunction development, requiring surgery (Figure 3).

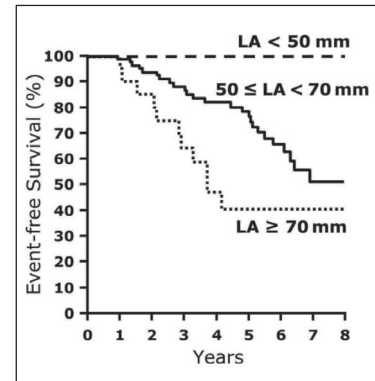


Figure 3: R. Rosenhek et al.

Incidence of Recurrent Cerebral Embolic Events After Patent Foramen Ovale and Atrial Septal Defect Transcatheter Closure

071

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Background Device closure of patent foramen ovale (PFO) or small atrial septal defects (ASD) is a suitable therapy for well selected patients after an embolic event. The procedure itself is safe and effective, however, a few potential complications have to be kept in mind. Amongst them, thrombus formation on the closure device is of major importance. In literature there is ongoing controversy, whether differences exist between various devices regarding the risk of thrombus formation. Therefore, we reviewed our own patient registry (TACET = The Austrian Paradoxical Cerebral Embolism Trial) with respect to this particular question.

Patients and Methods In our institution, 112 patients (53 male [47 %]; mean age 43 ± 11 years, age range 15–63 years) underwent PFO and/or ASD transcatheter closure between October 2002 and July 2004. All patients had suffered a cerebral embolic event and were considered for PFO/ASD closure because of a spontaneous or provokable right-to-left shunt during contrast transesophageal echocardiography (TEE). We used an Amplatzer occluder in 48 (43 %), a CardioSeal in 28 (25 %), a CardiaStar in 22 (19.5 %), and a StarFlex in 14 (12.5 %) patients. Device deployment was performed with TEE-guiding. All patients had a transthoracic echocardiogram (TTE) the day after the procedure, and a thorough TEE follow-up six months later. Periprocedurally, enoxaparin (1 mg/kg subcutaneously bid) was administered to each patient. In addition, 5000 IU of unfractionated heparin were injected intravenously in the cath lab. Antiplatelet therapy, started with the embolic event, was maintained for at least six months after the procedure.

Results The postprocedural TTE study was unremarkable in all patients. In two cases (1.8 %), six-month TEE follow-up revealed a small thrombus (1×1 mm) on the left atrial side of the device. Both patients had received an Amplatzer occluder. Antiplatelet therapy was maintained for another six months in both patients. None of them suffered a recurrent embolic event, and no more thrombus could be detected by repeated TEE.

Conclusions With current anticoagulation regimen the incidence of thrombus formation on PFO and ASD closure devices is low. In contrast to reports in literature, thrombi may occur on Amplatzer devices as well. A period of six months of antiplatelet therapy seems to be adequate in most patients, however, thorough TEE evaluation is mandatory before termination.

POSTERDISKUSSION A

Donnerstag, 8. Juni 2006, 17.30–18.30 Uhr

Sitzung I – Bildgebung

I-1

018

Effects of New Onset Treatment with Statins on Non-Calcifying Coronary Plaques: Noninvasive Assessment with Multislice Computed Tomography*W. Dichtl, S. Müller, G. J. Friedrich, O. Pachinger, D. zur Nedden, G. Feuchtnr
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Purpose Statins may influence coronary plaque composition. The aim of this study was to investigate the effects of a *de-novo* lipid-lowering therapy with statins on non-calcifying coronary artery plaques with multislice computed tomography (MSCT) after 6 months and one year of treatment.

Method and Materials 43 atherosclerotic lesions (in 11 patients) were assessed with MSCT coronary angiography (Sensation 16™, Siemens) (16 × 0.75 mm; rot. 0.42; table feed = 6.5 mm/s; eff. slice thickness 1 mm; increment 0.6; 500 mAs; 120 kV; B10f; 100 ml iodixanol (Visipaque 320™; Amersham); flow rate 3–4.5 ml/s; image reconstruction at mid-late systole (60–70 % of RR-interval) baseline and after 4–6 months or one year of new onset treatment with statins (20 mg atorvastatin/day or 20 mg simvastatin/day). Plaque area (PA), lumen area (LA), and mean CT-densities of non-calcifying plaque expressed as Hounsfield Units (HU) were measured. Only proximal coronary segments according to AHA/ACC classification were taken for the analysis (LCA 5–7, RCA 1–2, CX 11).

Results After one year *de-novo* treatment with statins (n = 20), a significant regression of plaque area (0.10 cm² vs. 0.05 cm²; p < 0.001) and a significant increase in mean CT-densities from 63 HU to 90 HU (p < 0.05) suggesting an increase in fibrotic and a reduction of lipidic plaque component was observed. After 6 months (n = 24), a moderate but yet significant decrease in PA (0.17 vs. 0.14 cm²; p = 0.02) was observed. The difference in luminal area was not significant after 6 months (0.06 vs. 0.07 cm²) and 1 year (0.12 cm² vs. 0.14 cm²) of treatment. The mean difference in the intraluminal contrast attenuation was 4.6 HU (0.6–14.4 cm²).

Conclusion Our data suggest that new onset of statin treatment may induce regression and lead to a stabilisation of non-calcifying coronary plaque within one year.

I-2

037

Multislice Computer Tomographic Coronary Angiography for Preoperative Risk Stratification in Patients Undergoing Liver Transplantation*S. Abbrederis¹, G. Feuchtnr², O. Pachinger³, W. Vogel¹, E. Gassner²,
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Purpose Multislice computer tomographic coronary calcium scoring (CCS) combined with angiography (MSCTA) of native coronary arteries has proven to be a reliable non-invasive imaging modality to detect coronary artery disease (CAD). Patients (pts) with end-stage liver disease scheduled for transplantation often present with a higher bleeding risk during invasive coronary angiography (CA) and are not suitable for stress testing. We sought to investigate the potential of MSCTA to evaluate CAD in these pts, compared to CA.

Methods A total of 26 pts underwent liver transplantation at our institution between may 2004 and july 2005. Preoperative ECG-gated contrast enhanced 16 row MSCTA (Siemens, Forchheim, Germany) with CCS was performed in 10 pts scheduled for liver transplantation. Pts (n = 4) with a very low CCS (< 50) and normal MSCTA were not referred to CA. CCS > 50, in combination or not with pathologic MSCTA (stenotic plaques), as well as low CCS pts with pathologic MSCTA were compared to CA (n = 6). Invasive coronary angiography without previous CTA was performed in 8 pts, transplantation was performed without CTA or CA in the remaining 8 pts with young age or negative coronary stress testing. Only 10 pts were suitable for stress testing with 100 % negative results. Peri- and posttransplantation clinical outcome was evaluated for each preoperative diagnostic approach.

Results Compared to CA, pts with pathologic MSCTA and/or high CCS (15–1519) had diffuse CAD without significant stenotic lesions (5/6). One presented a severe LAD stenosis with need for angioplasty/stenting, the stenotic lesion was correctly detected by MSCTA. Mild or non-stenotic CAD was found in the 8 pts with only preoperative CA. Peri- and postoperative outcome did not differ in the individual diagnostic groups: 25/26 pts had no cardiovascular complications during the follow-up period, in one patient (without pretransplantation CA or CTA) a heart failure event with subsequent recompensation occurred.

Conclusion MSCTA combined with CCS offers a reliable non-invasive imaging technique for the assessment of CAD and the peri- and postoperative cardiovascular risk stratification in pts undergoing liver transplantation. Preoperative CA may be reserved to pts with severe coronary pathology allowing additional preoperative therapeutical options.

I-3

038

Vergleich der hochauflösenden Spiral-CT-Koronarangiographie mit der konventionellen Koronarangiographie in der Detektion signifikanter Koronarstenosen*C. Steinwender¹, W. Schützenberger¹, S. Hönig¹, C. Focke², G. Haudum², F. Fellner²,
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Hintergrund Durch zunehmende technische Verbesserungen hat sich die Koronarangiographie mittels hochauflösender Spiral-Computertomographie (CT) zu einer diagnostischen Methode entwickelt. Die neueste CT-Generation („64-Zeiler“) ermöglicht durch dünnere Detektoren und schnellere Röhrenrotationszeiten eine noch höhere räumliche und zeitliche Auflösung der Koronargefäße. Der Einzug dieser Geräte in die klinische Praxis wird wegen des nichtinvasiven Charakters der Untersuchung die Vorgangsweisen zur Abklärung von Patienten (Pat.) mit vermuteter koronarer Herzkrankheit (KHK) verändern, auch wenn bisher keine umfassende Evaluierung ihrer diagnostischen Genauigkeit im Vergleich zur konventionellen Koronarangiographie (KKA) vorliegt. Wir untersuchten die Aussagekraft der CT-Koronarangiographie (CT-KA) mittels 64-Zeiler-CT bei Patienten mit Verdacht auf Vorliegen einer KHK im Vergleich zur nachfolgend durchgeführten KKA.

Methodik Seit Installation des 64-Zeiler-CT (Siemens „Somatom Sensation 64“) im Dezember 2005 wurden im Rahmen einer Kooperation zwischen Kardiologie und Radiologie konsekutiv Pat. mit mittlerer Prätestwahrscheinlichkeit für eine KHK einer CT-KA

sowie einer nachfolgenden KKA unterzogen. Die technische Durchführung der CT-KA im Spiralmodus beinhaltete eine Rotationszeit von 330 ms, ein retrospektives Gating und eine Kollimation von $64 \times 0,6$ mm. Stets wurde vor der CT-KA ein Kalziumscoring (Agatston-Score-Äquivalent, ASÄ) durchgeführt (Kollimation $24 \times 1,2$ mm). Patienten mit einer Herzfrequenz über 70/Minute erhielten Betablocker und Sedativa. Nicht eingeschlossen wurden Patienten nach Koronarinterventionen oder aortokoronarer Bypassoperation sowie Patienten mit Vorhofflimmern oder einem Kreatininwert von über 1,6 mg/dl. Überprüft wurden Sensitivität, Spezifität sowie positiv und negativ prädiktiver Wert (PPW, NPW) der Detektion von signifikanten Stenosen ($> 70\%$, SST) mittels CT-KA im Vergleich zur KKA. Die erhobenen Befunde wurden im Sinne einer patientenbasierten Analyse (Vorliegen oder Ausschluss von SST) und einer gefäßbasierten Analyse (4 Gefäßabschnitte pro Pat.: Hauptstamm [HS], Ramus interventricularis anterior [RIVA], Ramus circumflexus [RCX], rechte Koronararterie [RKA]) ausgewertet. Die Einteilung der Stenosen in signifikant und nichtsignifikant sowie der Bildqualität in sehr gut, gut, mittel und schlecht erfolgte im Konsens.

Ergebnisse Es wurden 51 Patienten (32 männlich) mit einem mittleren Alter von 61 ± 11 Jahren untersucht. Die mittlere Scanzeit betrug $14,2 \pm 0,8$ Sekunden, die mittlere Herzfrequenz der Pat. während der Untersuchung 55 ± 8 Schläge/Minute. Das mittlere ASÄ war 192 ± 258 . Bei 50 Patienten erlaubte die Bildqualität eine Untersuchung aller Gefäßabschnitte (sehr gut bei 43, gut bei 6, mittel bei 1 Pat.), bei einem Pat. machten Atemartefakte eine valide Befundung unmöglich. Die KKA am Tag nach der CT-KA fand insgesamt 28 SST bei 15 Pat. (30 %). In der patientenbasierten Analyse wurde mittels CT-KA bei 14 Pat. zumindest eine SST festgestellt, 1 SST wurde in der CT-KA als nichtsignifikant definiert (Sensitivität 93,3 %, PPW 87,5 %). Die nicht detektierte Stenose war eine kurzstreckige, nicht verkalkte SST der RKA. Bei 35 Pat. ohne SST wurde mittels CT-KA bei 2 Pat. eine SST suspekt, 33 Pat. wurden korrekt befundet (Spezifität 94,3 %, NPW 97,1 %). Beide überschätzten Stenosen waren hochgradig verkalkte Lumeneinengungen im RCX. In der gefäßbasierten Analyse wurden mittels CT-KA in den insgesamt 200 Gefäßabschnitten 20 von 28 SST korrekt erkannt (Sensitivität 71,4 %, PPW 86,9 %) sowie in den 172 nicht erkrankten Gefäßabschnitten 3 falsch-positive Befunde erstellt (Spezifität 98,3 %, NPW 95,4 %). Sämtliche nicht detektierten SST fanden sich in Gefäßabschnitten mit einem Durchmesser $< 2,5$ mm, alle überschätzten Lumeneinengungen waren stark verkalkte Läsionen.

Schlussfolgerung Die nichtinvasive Koronarangiographie mit einem 64-Zeiler-CT ermöglicht bei korrekter Durchführung und Beachtung der Kontraindikationen die Identifizierung von Patienten mit hämodynamisch wirksamen Koronarstenosen mit hoher Sensitivität und Spezifität. Die Beurteilung kleiner oder stark verkalkter Gefäßabschnitte bleibt aber auch mit dieser Technologie schwierig.

I-4

081

Accuracy of Non-Invasive 16-Slice CT Angiography in Patients with Stable Angina Pectoris Compared with Invasive Coronary Angiography

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Objectives To assess whether 16-slice computed tomography (CT) permits detection or exclusion of coronary artery disease in patients with stable angina.

Background Non-invasive coronary CT angiography is a promising coronary imaging technique.

Methods 30 consecutive patients with stable angina pectoris underwent routine invasive and CT coronary angiography. Retrospective ECG-gated CT coronary angiography was performed with a 16-slice CT-scanner (Philips MX 8000 IDT) after bolus-triggered i. v. administration of 100 ml non-ionic iodinated contrast medium. Betablockers were not administered routinely before the examina-

tion. In axial MSCT images and multiplanar reconstructions all coronary arteries and side branches exceeding 1.5 mm in diameter were assessed for the presence of stenoses using a 15-segment classification according to the American College of Cardiology/American Heart Association (ACC/AHA). The consensus results of two blinded readers were compared with quantitative coronary angiography analysis.

Results MSCT was performed successfully in all patients enrolled in our analysis. According to invasive coronary angiography 11 (37 %) patients had no significant coronary artery disease and 1VD, 2VD, and 3VD were found in 7 (23 %), 9 (30 %), and 3 (10 %) patients, respectively. After exclusion of all unevaluable segments, the sensitivity of coronary CT-angiography for detection of significant lesions was as high as 47 % (20 of 43 significant stenoses), specificity was 95 % (204 of 214), positive predictive value (PPV) was 67 % (20 of 30) and negative predictive value (NPV) was 90 % (204 of 227).

Conclusion Coronary MSCT is a sufficient method to exclude coronary artery disease. However, in the detection and quantification of significant coronary artery stenoses 16-slice CT cannot be regarded as a reliable diagnostic tool.

I-5

034

Der Einfluß der Einführung der „Late-enhancement“-Technik auf die Indikation zur kardialen Magnetresonananzuntersuchung in einem nichtuniversitärem Krankenhaus

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Das Ziel dieser Arbeit ist es, den Einfluß der Einführung der „Late-enhancement“-Technik auf die Indikation zur kardialen Magnetresonananzuntersuchung (MR) in einem nichtuniversitärem Krankenhaus zu untersuchen (Erfahrung mit kardialer MR seit 1997, 319 Untersuchungen, Gerät: Siemens Vision 1.5 T).

Die „Late-enhancement“-Technik basiert auf einer Sequenz, die einen hohen Kontrast zwischen normalem und fibrotischem Myokard erzeugt. Nachdem im Jahr 2000 die große Bedeutung der „Late-enhancement“-Technik bei der Beurteilung der myokardialen Vitalität nachgewiesen wurde, wurde diese Technik im Jahr 2003 in unserem Krankenhaus eingeführt. Seither hat die Häufigkeit der Indikationen „Erkrankungen der Aorta“, „Quantifizierung der Ventrikelfunktion“ und „Vitien“ abgenommen (von 26 % auf 4 % bzw. von 27 % auf 18 % bzw. von 11 % auf 3 % aller Indikationen), die Häufigkeit der Indikationen „kardiale Raumforderung“ und „Perikard-erkrankungen“ ist annähernd gleichgeblieben (13 % und 18 % bzw. 6 % und 3 % aller Indikationen), die Häufigkeit der Indikation „Myokard-erkrankungen“ hat zugenommen (von 6 % auf 30 % aller Indikationen), und 2 neue Indikationen wurden eingeführt: „dilatative Kardiomyopathie“ (Ausschluss einer ischämischen Kardiomyopathie oder Myokarditis) und „Vitalitätsprüfung“ (16 % bzw. 28 % aller Indikationen).

Vor der Einführung der „Late-enhancement“-Technik war die arrhythmogene rechtsventrikuläre Dysplasie die einzige Myokard-erkrankung, die mittels kardialer MR abgeklärt wurde (6 % aller Indikationen). Seit der Einführung der „Late-enhancement“-Technik wird die kardiale MR zur Abklärung nahezu aller Myokard-erkrankungen eingesetzt (arrhythmogene rechtsventrikuläre Dysplasie 10 %, Myokarditis 6 %, hypertrophe Kardiomyopathie 6 %, kardiale Sarkoidose 3 %, kardiale Hämochromatose 4 %, kardiale Amyloidose 1 % aller Indikationen).

Die Einführung der „Late-enhancement“-Technik hat das Spektrum der Indikationen zur kardialen MR in unserem Krankenhaus entscheidend verändert: die kardiale MR wird jetzt weniger als komplementäre Methode zur Abklärung der Ventrikelfunktion oder von Vitien verwendet, sondern vorwiegend als Methode zur myokardialen Gewebecharakterisierung.

I-6

054

Differences of Rosuvastatin and Simvastatin on Myocardial High-Energy Phosphate Metabolism: a Magnetic Resonance Spectroscopy Study

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Background In the last decade a variety of non-lipid lowering effects of statins have been described. However, it is unknown whether these pleiotropic effects are different between lipophilic and hydrophilic statins. Therefore we intended to compare the effects of a lipophilic (simvastatin) and a hydrophilic (rosuvastatin) statin on human myocardial high-energy phosphate (HEP) metabolism measured with 31-phosphorous magnetic resonance spectroscopy (MRS).

Methods 21 male patients (age 52 ± 10 years) with moderate to severe hypercholesterolaemia (mean 276 ± 56 mg/dl total cholesterol) were included. Patients were divided into 2 groups in a blinded fashion: group 1 received 10 mg rosuvastatin ($n = 10$), group 2 was put on 40 mg simvastatin ($n = 11$). MRS scan was performed using a clinical-standard whole-body scanner (Siemens) and PCr to beta-ATP (PCr/b-ATP) ratios were calculated to determine myocardial HEP metabolism. MRS scans were done before first intake of statins as well as 1 month and 6 months thereafter. In addition, blood samples were taken on the same time points to determine lipid profiles.

Results All clinical parameters were similar between groups at baseline. Additionally, total cholesterol (group 1: 290 ± 74 vs. 173 ± 36 vs. 189 ± 60 mg/dl; $p = 0.001$; group 2: 261 ± 23 vs. 158 ± 42 vs. 165 ± 15 mg/dl, $p = 0.001$) and LDL-cholesterol (group 1: 201 ± 41 vs. 99 ± 21 vs. 112 ± 42 mg/dl; $p = 0.002$; group 2: 178 ± 31 vs. 95 ± 33 vs. 101 ± 18 mg/dl; $p = 0.001$) was significantly reduced in both groups. However, PCr/b-ATP ratio increased significantly in group 1 (1.60 ± 0.34 vs. 1.68 ± 0.40 vs. 2.09 ± 0.46 ; $p = 0.016$). On contrast, PCr/b-ATP ratio remained unchanged in group 2 (1.72 ± 0.37 vs. 1.73 ± 0.30 vs. 1.88 ± 0.42 ; $p = n. s.$).

Conclusion In this small study, rosuvastatin (1 mg) significantly increased myocardial HEP metabolism whereas simvastatin (40 mg) did not change myocardial energy metabolism despite a comparable lipid-lowering effect. Our data suggest differences in non-lipid effects between hydrophilic and lipophilic statins which deserves further investigation.

I-7

053

Impact of Exercise Capacity on Myocardial High-Energy Phosphate Metabolism: a Magnetic Resonance Spectroscopy Study

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Background 31-phosphorous magnetic resonance spectroscopy (31P MRS) is a unique tool to investigate *in vivo* high-energy phosphate metabolism (HEP) in human heart. We hypothesized that physical capability may be positively correlated with myocardial HEP status.

Methods Healthy male volunteers ($n = 105$, mean age 51 ± 7 years) underwent bicycle ergometry with a stepwise increasing workload to determine maximal working capacity (MWC). Heart rate (HR) and blood pressure (BP) were measured continuously during exercise and 4 minutes of recovery. Further 31P MRS was performed to assess myocardial high-energy phosphate metabolism by determining phosphocreatine to beta-ATP ratios (PCr/b-ATP) using a 1,5 Tesla scanner.

Results Volunteers with a MWC > 230 Watt had significant higher PCr/b-ATP ratios than those with a MWC < 200 Watt (1.91 ± 0.3 vs. 1.59 ± 0.3 ; $p < 0.001$). Additionally, those with a recovery

systolic BP < 195 mmHg had significant higher ratios than those with a recovery SBP > 195 mmHg (1.74 ± 0.3 vs. 1.51 ± 0.2 ; $p < 0.05$). We observed a linear correlation between PCr/b-ATP ratio and MWC ($r = 0.411$; $p < 0.001$) and recovery SBP ($r = -0.290$; $p < 0.01$). After statistical correction for age these correlations remained significant.

Conclusions In this study we observed a correlation of parameters of physical fitness determined by bicycle exercise testing and cardiac PCr/b-ATP ratios. Whether increased PCr/b-ATP ratios will result in improved survival in this group of healthy volunteers deserves further investigation.

I-8

003

Assessment of Plaque Composition in Cardiac Allograft Vasculopathy by Virtual Histology™

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Background Previous pathologic studies of coronary plaque in heart transplant patients showed a predominance of fibrous plaque components.

Objective In this prospective study, we aimed to assess coronary plaque composition in cardiac allograft vasculopathy by intravascular ultrasound with Virtual Histology™ (Volcano Therapeutics Inc., CA, USA).

Methods Intravascular ultrasound runs with automatic pullback (0.5 mm/s) were available for 20 heart transplant patients. In each patient one lesion of interest was defined at the site of maximal coronary plaque burden. Analysis of plaque composition was performed with the Virtual Histology™ software.

Results Mean lesion length was 12.3 ± 4.7 mm. Three patients showed haemodynamically significant stenoses. Mean plaque burden was $31.6 \pm 9.2\%$ (minimal lumen diameter: 3.0 ± 0.7 mm; minimal lumen area: 9.4 ± 3.7 mm). Plaque composition as assessed by Virtual Histology™ was predominantly fibrotic (62 %), whereas fibro-fatty, calcified and necrotic plaque fractions were represented by 20 %, 11 %, and 7 %, respectively.

Conclusion Intravascular ultrasound with Virtual Histology™ allows differentiation of coronary plaque components in cardiac allograft vasculopathy without need for biopsy. Comparably to previous *ex vivo* studies, plaque composition in heart transplant patients was predominantly fibrotic.

Sitzung II – Intervention/Basic

II-1

074

Mobilisation of Bone Marrow Mesenchymal Stem Cells in Response to Myocardial Ischaemia Depends on the Duration of the Coronary Occlusion in Pig Myocardial Infarction Model

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Background Myocardial ischaemia induces mobilisation of bone marrow- (BM-) derived stem cells (SC) leading to homing of BM SCs in infarcted myocardium resulting in angiogenesis and myogenesis. The aim of the present study was to investigate the effect of ischaemic preconditioning on the mobilisation of BM haematopoietic and mesenchymal SCs in porcine coronary occlusion/reperfusion.

Methods Catheter-based coronary occlusion followed by reperfusion was performed in 17 pigs (group AMI). Preconditioning was obtained in 18 pigs (group P) by 2 cycles of 5 min of balloon occlu-

sion of LAD with 2 cycles of 5 min interval of reperfusion before the coronary occlusion and reperfusion. The duration of the coronary occlusion was between 30 and 90 min, of the reperfusion between 30 and 60 min. Enddiastolic and endsystolic volumes calculated from the area-length method of echocardiography served for the evaluation of the global left ventricular EF. Plasma levels of troponin I and myoglobin were measured after the end of the reperfusion by using ELISA kits. CD 45⁺, CD90⁺, CD31⁺ and CD44⁺ cells, as representatives of BM haematopoietic and mesenchymal SCs, were taken at baseline and at the end of the final reperfusion from venous blood and counted by whole blood flow cytometry.

Results The relative increase (ratio of post-final reperfusion and baseline values) in haematopoietic SC concentration was observed in both groups ($132 \pm 96\%$ vs. $105 \pm 38\%$ in groups AMI and P). The mesenchymal SC relative increase was significantly higher in group AMI compared to group P ($155 \pm 176\%$ vs. $80 \pm 19\%$; $p < 0.05$). A trend towards higher global ejection fraction was observed in group P, without significant difference between the groups regarding the levels of cardiac enzymes (troponin I and myoglobin). The relative increase of the mesenchymal stem cells correlated positively linearly with the duration of the coronary occlusion ($r = 0.642$; $p = 0.0862$) and troponin I ($r = 0.654$; $p = 0.05$) only in group AMI. The duration of coronary occlusion did not influence the mobilisation of the BM SCs in group P.

Conclusion Ischaemic preconditioning attenuates the mobilisation of mesenchymal BM SCs in porcine myocardial infarction model. There is a direct link between the duration of ischaemia and the mobilisation of mesenchymal SCs after coronary occlusion without preconditioning.

II-2

095

Severe Oversizing of a Paclitaxel Eluting Coronary Stent Is Associated with Unfavourable Results in a Porcine Coronary Stenting Model

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Background Oversizing (stent/artery ratio of more than 1.2:1) of stents implanted in porcine coronary arteries serves as a simulation of vascular wall damage after stenting in humans. Two clinical studies reported that oversizing of a sirolimus-eluting stent is not associated with unfavourable outcome compared with moderate dilation. However, no data exist about the effect of oversizing stent implantation with use of paclitaxel-eluting stent (PES).

Methods Twenty-two PESs were implanted in the left anterior descending and left circumflex porcine coronary arteries under general anaesthesia. Eleven stents were implanted with gross oversizing (1.2:1.0 stent artery ratio, group A) and 11 with standard sizing (1.1:1.0 stent artery ratio, group B), by using appropriate stent balloon inflation pressure. After 1-month follow-up (FUP), control coronary angiography was performed. The histopathological and histomorphological results of the explanted arteries of the 2 groups were compared.

Results Unusually high post-stent complications, spasms, partially vessel occlusions were recorded in the group A, as compared with group B. At FUP, 3 subtotal vessel occlusions were recorded in group A. In contrast, in group B, 1 pig died during the procedure due to acute vessel occlusion. Minimal lumen diameter (MLD) at FUP was significantly higher in group A as compared to B (1.22 ± 0.54 vs. 2.21 ± 0.50 ; $p = 0.001$). However, percent diameter stenosis (DS%) was significantly higher in group A (47.2 ± 25.54 vs. 25.8 ± 15.9 ; $p = 0.036$) at FUP. Pigs of group A exhibited significantly more severe neovascularisation, intima inflammation and higher neointimal area (1.82 ± 1.40 vs. 0.70 ± 1.25 ; 2.31 ± 0.78 vs. 1.50 ± 0.85 and 1.79 ± 0.94 vs. 0.93 ± 0.32 ; $p < 0.05$, respectively.). There were no significant differences in fibrin deposition, endothelialisation, necrosis, media and adventitia inflammation, injury score, lumen area and internal and external elastic lamina area (IEL and EEL area) between the groups.

Conclusions Gross oversizing (1.2/1.0 stent: artery ratio) of a PES is associated with more frequent procedure complications, higher degree of vessel injury and therefore an unfavourable outcome at FUP as compared to the standard sizing (1.1:1.0 stent: artery ratio) of the stenting.

II-3

096

Structural Changes of Arterial Wall Induced by Drug-Eluting Stent Implantation Decrease Vasodilatory Response of Coronary Arteries Determined by Intracoronary Pulse Wave Analysis in Pigs

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Objective The aim of our study was to investigate the influence of arterial wall structural changes caused by paclitaxel-eluting stent (PES) implantation on the non-endothelium-dependent vasodilatory response determined by intracoronary pulse wave analysis in porcine coronary arteries.

Methods Paclitaxel-eluting stents ($n = 31$) or bare-metal stents (BMS) ($n = 40$) were implanted in the left anterior descending and left circumflex porcine coronary arteries. After 1 month, after diagnostic coronary angiography, pressure wire (PW) measurements using intracoronary adenosine bolus ($40 \mu\text{g}$) were performed. Peak systolic pulse amplitudes (SPA) were measured at baseline and after maximal vasodilation, and the difference was calculated (deltaSPA) in stented arteries free from significant in- or persistent stenosis ($n = 22$ PES and $n = 27$ BMS), and correlated with the histopathologic and histomorphometric parameters of the explanted arteries.

Results Fibrin deposition, medial thickening, inflammation and vascular wall remodelling were significantly elevated, and endothelialisation was significantly impaired in pigs with PES, as compared with BMS. Baseline PSA was similar in arteries with BMS or DES, but adenosine-induced PSA and the deltaPSA was significantly smaller in PES. The deltaPSA exhibited a linear negative correlation with fibrin score ($p < 0.001$; $r = 0.56$), vascular wall overall inflammation ($p = 0.01$; $r = 0.53$), and media area ($p < 0.001$; $r = 0.69$) reflecting a direct association between unfavourable vascular wall structural changes and decreased vascular compliance of the coronary arteries.

Conclusions Implantation of a PES impairs coronary artery wall structure and, consequently, also the endothelium-independent vessel wall dynamics determined by intracoronary pulse wave analysis as compared with BMS.

II-4

070

Inhibition of IL-1-beta Convertase and Caspase-1 Reduces the Neointimal Development After Balloon Injury and Stenting of the Porcine Coronary Arteries

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Purpose Intravenous application of interleukin-1 (IL-1) receptor antagonist has been shown to be associated with a sustained, significant reduction of neointimal proliferation after vessel wall injury. The aim of our study was to investigate the effect of the irreversible IL-1-beta convertase and caspase-1 inhibitor acetyl-tyrosinyl-valyl-alanyl-aspartylchloromethyl-ketone (Ac-YVAD-cmk) on the development of neointima after oversized balloon injury and stenting of the porcine coronary arteries.

Methods Sixteen pigs received intracoronary infusion of 50 mg Ac-YVAD-cmk into the left coronary arteries before stenting (group 1, $n = 8$) or oversized balloon injury (group 2, $n = 8$), while 16 animals served as controls (group 3 with stenting, $n = 7$ and

group 4 with balloon injury, $n = 9$). After 4 weeks control coronary angiography was performed. The degree of neointimal hyperplasia was assessed by histomorphometry. Terminal transferase-mediated dUTP nick end labeling (TUNEL) was carried out to calculate the percentage of the number of apoptotic cells in relation to the total number of intimal cells. The tissue IL-1-beta concentration was measured by porcine specific ELISA.

Results Histomorphometry revealed significantly ($p < 0.05$) smaller neointima in the Ac-YVAD-cmk treated groups as compared with the controls: neointimal area in stent groups: 0.7 ± 0.2 vs. 1.73 ± 0.76 mm² in groups 1 vs. 3; and in balloon groups: 0.5 ± 0.58 vs. 0.93 ± 0.7 mm², in groups 2 vs. 4. Similarly, the maximal % area stenosis was significantly ($p < 0.05$) smaller in treated groups: 31.2 ± 11 % vs. 53.8 ± 12.6 %, in groups 1 vs. 3 (stent groups); and 21.8 ± 21.3 % vs. 42.0 ± 22.8 % in groups 2 vs. 4 (balloon groups). Lower apoptotic indices of the neointimal cells were observed in the treated animals as compared with the controls: stent groups (group 1 vs. 3): 3.5 ± 3.8 % vs. 13.4 ± 8 %, and balloon groups (group 2 vs. 4): 4.7 ± 5.8 % vs. 13.8 ± 8.6 % of total intimal cells. The coronary arterial tissue IL-1-beta level was significantly ($p < 0.05$) decreased in the animals treated with Ac-YVAD-cmk, as compared with the controls: stent groups (groups 1 vs. 3): 0.29 ± 0.13 vs. 0.6 ± 0.21 pg/mg protein, and balloon groups (groups 2 vs. 4): 0.27 ± 0.15 vs. 0.54 ± 0.18 pg/mg protein. The tissue IL-1-beta level exhibited a positive linear correlation ($r = 0.68$; $p < 0.001$) with the degree of neointimal hyperplasia.

Conclusions Pre-procedural intracoronary administration of IL-1-beta convertase and apoptosis inhibitor results in significantly decreased neointimal hyperplasia in the animal model of coronary stenting or oversizing balloon injury.

II-5

050

Decrease of Neointimal Hyperplasia After Implantation of Paclitaxel-Eluting Stents in Porcine Internal Carotid Artery

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Aims Stent placement for intracranial carotid artery stenosis can be achieved with a high success rate, but the likelihood of restenosis due to intimal hyperplasia is relatively high. The aim of our study was to evaluate the development of neointimal hyperplasia after implantation of paclitaxel-eluting stents (PES) compared to bare-metal stents (BMS) of the same design in porcine internal carotid arteries.

Methods Carotis and cerebral angiography and stent implantations were performed under general anaesthesia in 10 domestic pigs (weight 18–30 kg), after pre-treatment with loading dose of *per os* aspirin (100 mg) and clopidogrel (300 mg), and administration of 100 U/kg heparin. PES ($n = 9$) and BMS ($n = 11$) were placed in the left and right internal carotid arteries at the border area of the extra- and intracranial part. Stent size (2.75–3.0 mm) and implantation pressure (10–14 atm) were chosen to achieve a stent:artery ratio of 110 %. During the 4-week follow-up, *per os* aspirin (100 mg) and clopidogrel (75 mg) were administered. After 4 weeks, control cerebral angiography was performed and subsequently, the animals were euthanised and the carotid arteries were explanted for histopathologic (fibrin deposition, endothelialisation, inflammation, necrosis and haemorrhagia assessed by standardised score system, and injury score) and histomorphometric analyses.

Results Carotid angiography at follow-up revealed a binary restenosis rate of 36.4 % for BMS and 11.1 % for PES. No significant differences were found between the groups as regards the histopathological changes. The mean injury score was 1.4 ± 0.2 and 1.3 ± 0.2 in BMS and PES group, respectively. Histomorphometric analysis revealed significant ($p < 0.05$) smaller neointimal hyperplasia after implantation of PES as compared with BMS: neointimal area: 0.84 ± 0.52 vs. 1.45 ± 0.91 mm², % area stenosis: 24.3 ± 19.9 vs. 39.2 ± 25.0 %, maximal neointimal thickness: 0.16 ± 0.14 vs. 0.32 ± 0.27

mm. Implantation of PES and BMS did not lead to edge restenosis or vessel remodelling in internal carotid arteries.

Conclusions Implantation of PES in the internal carotid arteries results in a significant decrease of neointimal hyperplasia, without unfavourable edge effect or vessel remodelling.

Sitzung III – Diverse 1

III-1

019

Cardiologic and Neurologic Findings in Left Ventricular Hypertrabeculation/Noncompaction Relating to Echocardiographic Indication

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Background Left-ventricular hypertrabeculation/noncompaction (LVHT) is characterised by prominent trabeculations and intertrabecular recesses. LVHT is usually diagnosed if a patient is referred for echocardiography. The study assessed if cardiologic and neurologic findings differ relating to indication for echocardiography.

Methods We included patients in whom LVHT was diagnosed in one echocardiographic laboratory between June 1995 and December 2005. All patients underwent a cardiologic examination and were invited for a neurological investigation.

Results LVHT was diagnosed in 93/35,181 patients (26 female, 53 ± 15 years). Heart failure was the most frequent indication ($n = 49$), followed by chest pain ($n = 21$), syncope ($n = 8$), search for cardiac involvement in myopathy ($n = 7$), stroke or embolism ($n = 3$), arterial hypertension ($n = 3$), and screening of LVHT patients' relatives ($n = 2$). Patients with indication "heart failure" were older than patients with other indications (59.4 ± 13.1 vs. 44.9 ± 12.9 years; $p < 0.001$), more often had a neuromuscular disorder of unknown etiology (53 vs. 32 %, $p < 0.05$), exertional dyspnoea (96 vs. 32 %; $p < 0.001$), edema (25 vs. 7 %; $p < 0.05$), and advanced heart failure (NYHA III: 41 vs. 11 %; $p < 0.01$; NYHA IV: 29 vs. 9 %; $p < 0.05$), suffered less often from arterial hypertension (22 vs. 41 %; $p < 0.05$), angina pectoris (14 vs. 34 %; $p < 0.05$), and palpitations or syncope (10 vs. 30 %; $p < 0.05$). Patients with indication "heart failure" less frequent had a normal ECG than patients with other indications (2 vs. 18 %; $p < 0.01$), more frequent had ≥ 2 ECG abnormalities (57 vs. 36 %; $p < 0.05$), left bundle branch block (29 vs. 9 %; $p < 0.05$), a larger left-ventricular enddiastolic diameter (69.9 ± 9.7 vs. 57.4 ± 12.2 mm; $p < 0.001$), a lower left-ventricular fractional shortening (16.9 ± 6.1 vs. 31.1 ± 11.5 %; $p < 0.001$) and more often had valvular abnormalities (76 vs. 30 %; $p < 0.001$). Location and extension of LVHT did not differ between indication groups.

Conclusion Echocardiographers should be aware of LVHT in any indication for echocardiography.

III-2

021

Cardiologic and Neuromuscular Comorbidity Influences Mortality of Patients with Left Ventricular Hypertrabeculation/Noncompaction: Comparison with the Austrian Normal Population

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Objective Left ventricular hypertrabeculation/noncompaction (LVHT) is characterised by prominent trabeculations and intertrabecular recesses. LVHT patients suffer from heart failure, arrhythmias, chest pain and neuromuscular disorders (NMD). Data about long-term prognosis of LVHT are controversial. Aim of the study was to compare the mortality of LVHT patients with that of the Austrian normal population and to assess, which clinical and echocardiographic parameters influence mortality and if mortality differs between patients with and without NMD.

Methods and Results In 86 patients LVHT was diagnosed echocardiographically between June 1995 and December 2004 (21 female, mean age 52 ± 14 , range 14–94 years). A specific NMD was diagnosed in 21, a NMD of unknown etiology in 33, the neurologic investigation was normal in 13 and 19 patients refused. During a mean follow-up of 51 months (range 3–106 months) the mortality rate was 5.3 %/year. Compared with the Austrian population the standardised mortality ratio (SMR) of LVHT patients was 5.584 (95% CI 3.562–8.754; $p = 0.000$). The SMR was high in LVHT patients with NMD of unknown etiology, who refused the neurologic investigation, with heart failure, diabetes mellitus, syncope, ventricular ectopic beats, pathologic Q waves, left anterior hemiblock, atrial fibrillation and low-voltage ECG. Patients with LVHT in the anterior, posterior and lateral wall and patients with more extensive LVHT had a high standardised mortality ratio.

Conclusions Mortality in LVHT patients is higher than in the normal population and cardiac and neurologic morbidity is the presumed cause for the increased mortality.

III-3

020

Prognosis of Left Ventricular Hypertrabeculation/Noncompaction Is Dependent on Cardiac and Neuromuscular Comorbidity

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Background Left ventricular hypertrabeculation/noncompaction (LVHT) is a cardiac abnormality frequently associated with neuromuscular disorders (NMD). From initial case reports, LVHT is assumed to have a poor prognosis. Aim of the study in a cohort of LVHT patients was to assess the long-term prognosis regarding mortality, cardiac and neuromuscular comorbidity and progression of cardiac and neuromuscular disease.

Methods and Results In 86 patients LVHT was diagnosed echocardiographically between June 1995 and December 2004 (21 female, mean age 52 ± 14 , range 14–94 years). All patients underwent a baseline cardiologic investigation and were invited for a neurologic investigation. A specific NMD was diagnosed in 21, a NMD of unknown etiology in 33, the neurologic investigation was normal in 13 and 19 patients refused. During a mean follow-up of 51 months (range 3–106 months) the mortality rate was 5.3 %/year. Predictors for an increased mortality were increased age ($p = 0.0134$), presence of NMD ($p = 0.0324$), exertional dyspnoea ($p = 0.0329$), edema ($p = 0.0049$), heart failure ($p = 0.0048$), left anterior hemiblock ($p = 0.0078$) and a left ventricular fractional shortening < 25 % ($p = 0.0648$).

Conclusion The mortality of LVHT in adult patients is lower than previously thought. Predictors for mortality are increased age, neuromuscular disorder, heart failure, left ventricular dilatation and systolic dysfunction.

III-4

005

Erste Ergebnisse einer ambulanten Phase-II-Rehabilitation kardialer Patienten in Österreich

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Einleitung Ein nicht unwesentlicher Teil der Patienten mit koronarer Herzerkrankung (KHK) lehnt aus unterschiedlichen Gründen eine stationäre Rehabilitation (Rehab) nach einem Akutereignis ab. Um einigen dieser Patienten wohnortnahe eine adäquate Rehab zu ermöglichen, wurde ein ambulantes Programm zur Früh-Rehab bei KHK (= Phase II nach WHO, A-PhII) etabliert. Die vorliegende Untersuchung überprüfte Machbarkeit und Effektivität dieses Angebots an einer multizentrisch erfaßten Patientengruppe.

Patienten und Methodik In einem Zeitraum von 2,5 Jahren wurden 90 Patienten in das Programm aufgenommen. Sie kamen viermal pro Woche 2–4 Stunden in das Zentrum und wurden für insgesamt 50 Stunden rehabilitiert. Das komprehensive Rehab-Programm umfaßte neben der ärztlichen Führung ein körperliches

Training, Schulungen sowie psychologische Betreuung. Als Ergebnisse wurden u. a. die Veränderung der kardiovaskulären Risikoparameter untersucht und mittels Selbstbeurteilungsfragebögen Angst und Depressivität als Ausdruck der psychodynamischen Veränderungen erfaßt.

Ergebnisse Von den 90 Patienten, die in das Programm eintraten, waren 73 % männlich, das mittlere Alter betrug $55,9 \pm 10,7$ Jahre. Bei 39 % der Patienten war eines, bei 37 % waren zwei und bei 24 % drei Koronargefäße betroffen. Bei 72 % der Patienten war eine Koronardilatation, bei 7 % eine Bypassoperation durchgeführt worden. 9 Patienten brachen das A-PhII vorzeitig ab, wobei in 5 Fällen medizinische, in 4 sonstige Ursachen zugrunde lagen. Die vorgegebenen Rehab-Ziele wurden weitgehend erreicht. Die ergometrische Leistungsfähigkeit stieg von $69,2 \pm 14,9$ % auf $79,4 \pm 17,1$ % ($p < 0,001$). Der Blutdruck betrug bei Abschluß $121,3 \pm 17,2/76,6 \pm 7,9$ mmHg und die Lipidparameter verbesserten sich signifikant (LDL-Cholesterin: $110,2 \pm 29,5$ vs. $93,5 \pm 22,6$; $p < 0,001$). Der mittlere Angstscore fiel bis Rehab-Ende von $6,3 \pm 3,7$ auf $4,9 \pm 3,5$ ($p < 0,001$), der mittlere Depressivitätswert von $4,4 \pm 3,4$ auf $3,7 \pm 3,0$ ($p < 0,01$). Die Motive für die Absolvierung des A-PhII waren die Erhaltung des vertrauten Umfelds (29 %), die Erfüllung sozialer (24 %) oder beruflicher (10 %) Verpflichtungen oder der drohende Autonomieverlust (17 %). An Zwischenfällen traten 3 lebensbedrohliche Komplikationen auf, bei 3 Patienten erfolgte elektiv eine koronare Reintervention.

Schlußfolgerung Die Effektivität eines A-PhII ließ sich anhand der vorliegenden Ergebnisse zeigen. Es stellt für ein spezielles Kollektiv an Patienten eine wertvolle Alternative zum stationären Rehab-Angebot dar. Somit können zusätzliche Patienten für den Rehab-Prozess gewonnen werden. Voraussetzung für die Effektivität und Patientensicherheit sind aufgrund der hohen fachlichen und organisatorischen Anforderungen der A-PhII die Einhaltung der geforderten Standards (ÖKG, PVA) bezüglich der Struktur- und Prozessqualität.

III-5

075

Zuweisungspraxis und Ergebnisse der standardisierten Ergometrie

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Einleitung Die Ergometrie stellt bei der koronaren Herzkrankheit (KHK) eine der wichtigsten und nach wie vor am häufigsten angewendeten Vorfelduntersuchungen dar. Berichte über geschlechts-spezifische Unterschiede in Inzidenz, Klinik und Diagnostik der KHK erfordern daher auch eine kritische Reevaluierung der Zuweisungs- und Auswertungspraxis ergometrischer Belastungstests.

Patienten und Methodik Es wurden alle im Zeitraum vom 1.5. 2004 bis 30.4.2005 an der Wiener Universitätsklinik für Innere Medizin II, Kardiologie, durchgeführten Ergometrien retrospektiv hinsichtlich Zuweisungsdiagnose, Leistungsfähigkeit, Blutdruck- und Herzfrequenzverhalten, EKG-Veränderungen, Ergebnis und Abbruchkriterien untersucht. Die statistische Auswertung erfolgte mittels ANOVA.

Ergebnisse Im Beobachtungszeitraum wurden bei insgesamt 1528 Patienten (508 Frauen, 1020 Männer) Belastungs-EKGs durchgeführt. Das durchschnittliche Alter betrug 54 Jahre bei Frauen und 55 Jahre bei Männern, der BMI war 25,5 bei Frauen im Vergleich zu 27,1 bei Männern (n. s.). Die Zuweisungsgründe waren Hypertonie (30,5 % ♀, 26,6 % ♂; n. s.), Rhythmusstörungen (28,5 % ♀, 20,5 % ♂; $p < 0,05$), KHK (26,4 % ♀, 34,7 % ♂; $p < 0,05$), vorausgegangene perkutane Koronarintervention (10,2 % ♀, 18,4 % ♂; $p < 0,01$), Vitien (9,3 % ♀, 8 % ♂; n. s.), Dyspnoe (5,7 % ♀, 2,2 % ♂; $p < 0,01$), atypische Angina pectoris (5,7 % ♀, 2,8 % ♂; $p < 0,01$), stabile Angina pectoris (5,3 % ♀, 4,5 % ♂; n. s.), Zustand nach Myokardinfarkt (3,7 % ♀, 10,2 % ♂; $p < 0,01$) sowie seltenere Diagnosen wie Herztransplantation und Synkope. Das Ergebnis der Ergometrie war bei 9,7 % der Frauen und 11,9 % der Männer positiv (n. s.), bei 37,2 % (♀) gegenüber 39,7 % (♂) möglich bzw. nicht eindeutig positiv (n. s.), bei 28,5 % der Frauen und 28,0 % der Män-

ner negativ (n. s.) und bei 24,2 % (♀) bzw. 20,4 % (♂) war die Ergometrie nicht konklusiv (n. s.).

Schlussfolgerung Obwohl bei Frauen signifikant häufiger eher „atypische“ Symptome (Rhythmusstörungen, Dyspnoe, atypische Angina pectoris) und bei Männern signifikant gehäuft „typische“ Symptome (KHK, PCI, Myokardinfarkt) zur Zuweisung geführt haben, ist doch das Ergebnis der Ergometrie in einem ähnlich hohen Prozentsatz positiv – bei Frauen wie bei Männern. Weiters zeigt die Tatsache, daß doppelt so viele Männer wie Frauen innerhalb des Beobachtungszeitraumes einer Ergometrie zugeführt wurden, daß offenbar das Risiko für das Auftreten einer KHK von weiblichen Patienten und deren behandelnden Ärzten noch immer unterschätzt wird.

III-6

101

Klinische Symptomatik und Auffälligkeiten im EKG bei Patienten mit zentraler und peripherer Pulmonal-embolie

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Hintergrund und Ziel Ziel der vorliegenden Studie war es, bei Patienten mit akuter Pulmonalembolie (PE) klinische Parameter und diverse Veränderungen im EKG zum Zeitpunkt der Aufnahme zum klinischen Schweregrad (zentrale oder periphere PE) zu korrelieren.

Methoden Es wurden 426 konsekutive Patienten mit akuter Pulmonalembolie (zentral/peripher) an zwei Zentren (Notaufnahme des Allgemeinen Krankenhauses Wien, 2. und 3. Medizinische Abteilung des Wilhelminenspitals Wien) retrospektiv in diese Studie eingeschlossen. An klinischen Parametern wurden die Symptome zum Zeitpunkt der Präsentation (Belastungsdyspnoe, Ruhedyspnoe, Tachypnoe, pleuritische Schmerz, Hämoptysen), Auffälligkeiten im 12-Ableitungs-EKG (P-pulmonale, S1Q3T3- und S1S2S3-Lage-typen, Rotation im Uhrzeigersinn, inkompletter und kompletter Rechtsschenkelblock, ST-Streckensenkungen sowie ST-Hebungen in Ableitung aVR und V₁) und die durchgeführte Therapie (Heparine oder Thrombolyse) dokumentiert. Die erhobenen Daten wurden anhand des unterschiedlichen Schweregrades der PE (zentral oder peripher) miteinander verglichen. Die statistischen Berechnungen (Chi-Square-Tests und multivariable Analysen) wurden in der Version 11.04 der Software SPSS durchgeführt.

Resultate Patienten mit zentraler PE (n = 151) litten im Vergleich zu Patienten mit peripherer PE (n = 275) signifikant häufiger (p < 0,001) unter Ruhedyspnoe (46,4 % vs. 25,8 %) und Tachypnoe

(29,1 % vs. 10,9 %), wohingegen sowohl pleuritische Schmerzen (33,1 % vs. 54,2 %) als auch Hämoptysen (0,7 % vs. 9,1 %) signifikant häufiger bei Patienten mit peripherer PE auftraten (p = 0,001). Patienten mit zentraler PE wiesen auch häufiger Auffälligkeiten im EKG auf (Abbildung 4). Vor allem die isolierte ST-Hebung in aVR erwies sich als hochsignifikanter Parameter für ein zentrales Geschehen. In einer multivariablen Analyse wurden die für zentrale PEs typischen klinischen Parameter mit den signifikanten EKG-Veränderungen verglichen. Während die ST-Hebung in V₁ ihre Signifikanz verlor, zeigten sich für Tachypnoe, Ruhedyspnoe, P-pulmonale und ST-Hebung in aVR weiterhin signifikante Ergebnisse (Tabelle 1). Insgesamt erhielten 65 Patienten eine thrombolytische Therapie (15 %). Bei 67 % dieser Patienten war auch eine ST-Hebung in Ableitung aVR nachweisbar.

Tabelle 1: T. Höchtl et al.

Klinischer Parameter	p-Wert	Odds-Ratio (OR)
ST-Hebung aVR	0,02	2,1
Tachypnoe	0,03	2,1
P-pulmonale	0,07	2,1
Ruhedyspnoe	0,07	1,6

Diskussion Patienten mit zentraler Pulmonalembolie sind bei Aufnahme symptomatischer und weisen häufiger EKG-Veränderungen auf. Vor allem eine isolierte ST-Hebung in aVR spielt als unabhängiger Parameter hochsignifikant für ein zentrales Geschehen eine Rolle und könnte in der Indikationsstellung für eine thrombolytische Behandlung hilfreich sein.

III-7

033

Kardiologische Patienten in einem Rehabilitationszentrum

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Hintergrund (1) Die kardiologische Rehabilitation als Anschlussheilverfahren stellt ein wichtiges Element im Gesamtgesundungsprozeß eines Patienten dar. Es gibt aber nur wenig Information darüber, wie sich das Kollektiv dieser Patienten zusammensetzt. (2) Neben der medikamentösen Therapie nimmt die Gerätetherapie (PM, ICD, CRT) einen immer größer werdenden Stellenwert bei kardiologischen Patienten ein, insbesondere bei Patienten mit Herzinsuffizienz. Jüngst aktualisierte Guidelines zum Management der chronischen Herzinsuffizienz tragen dieser Tatsache Rechnung. Zwar gibt es epidemiologische Überlegungen, wie viele Patienten aber letztlich für diese Therapien in der Praxis in Frage kommen, im speziellen für das Patientenkollektiv in einem Rehabilitationszentrum, war bislang nur ungenügend genau bekannt. Ziel dieser Untersuchung war es, diese beiden Themen zu evaluieren.

Methoden Über den Zeitraum von 3 Monaten wurden die Daten sämtlicher unter einer kardialen Diagnose einem Rehabilitationszentrum zugewiesenen Patienten mit Aufschlüsselung nach Alter, Geschlecht, Entlassungsdiagnose, Linksventrikelfunktion, Grundrhythmus, QRS-Breite, NYHA-Stadium, Geräteversorgung (PM, ICD, CRT), Ereignissen im Holter-EKG sowie Medikation bei Aufnahme und Entlassung erfaßt. Anhand des NYHA-Stadiums, der QRS-Breite und der meist echokardiographisch ermittelten linksventrikulären Auswurf-fraction (LVEF) wurde außerdem die Anzahl jener Patienten ermittelt, für die eine CRT-Indikation zur Behandlung der ventrikulären Dyssynchronie oder ICD-Indikation zur Verhinderung des plötzlichen Herztodes bestand.

Ergebnisse Insgesamt wurden in einem österreichischen Rehabilitationszentrum in 3 Monaten 325 Patienten (Durchschnittsalter 65 Jahre [22–91], 67 % Männer) mit einer kardialen Diagnose aufgenommen. 70 % hatten eine KHK, 47 % waren Post-MI, 35 % wurden nach Bypassoperation behandelt, 34 % nach PTCA und 15 % nach Klappenoperation. In diesem Patientenkollektiv wiesen 21 % der Patienten eine Herzinsuffizienz auf und ebenfalls 21 % hatten eine deutlich (LVEF 30–40 %: 15 %) oder hochgradig (LVEF < 30 %: 6 %) eingeschränkte Pumpfunktion. Im Zeitraum

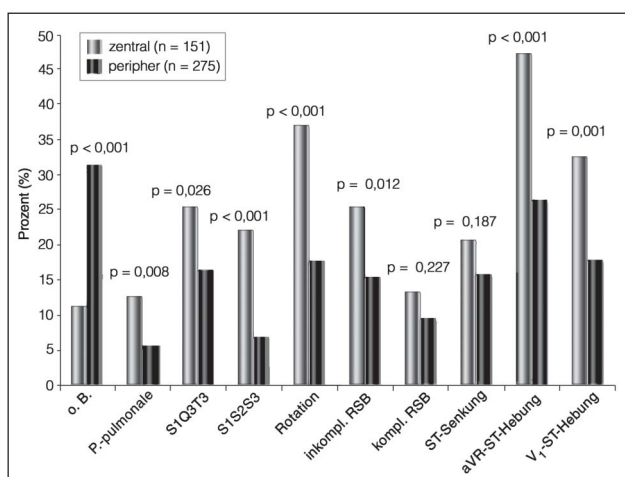


Abbildung 4: T. Höchtl et al.

von 3 Monaten waren – je nach Auslegung der aktuellen Guidelines bzw. Studienergebnisse – zwischen 3 (QRS-Breite ≥ 150 ms) und 9 Patienten (QRS-Breite ≥ 120 ms) für eine CRT indiziert. 19 Patienten (5 % aller Patienten) waren für eine primärpräventive ICD-Implantation indiziert.

Konklusion Es zeigt sich, daß auch in den nicht implantierenden Zentren eine erhöhte Aufmerksamkeit auf die apparative Therapie der Herzinsuffizienz gerichtet werden muß. Das gilt sicher nicht nur für Rehabilitationszentren, sondern auch für Grundversorgungsspitäler und niedergelassene Internisten. Weiters sollten in der Rehabilitation die Instrumente der Trainingsplanung, Trainingsdurchführung und Trainingskontrolle stetig verfeinert werden, um der wachsenden Gruppe der herzinsuffizienten Patienten adäquat beistehen zu können.

III-8

045

State Anxiety Is Significantly Reduced by Psychological Support Including Respiratory Sinus Arrhythmia (RSA) Biofeedback Prior to Cardiac Catheterisation (CC)

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Introduction Cardiac catheterisation, the standard procedure for invasive evaluation of coronary artery disease, has been commonly reported to cause anxiety, fear and emotional stress.

Aim The effect of a psychological support including respiratory sinus arrhythmia (RSA) biofeedback training prior to CC was studied in order to reduce anxiety and emotional stress during elective CC.

Patients and Methods 212 patients undergoing CC for routine elective invasive evaluation of stable coronary artery disease were studied. In the psychological support group ($n = 106$, mean age 65.9 years) a structured psychological conversation and RSA biofeedback training was offered to the patients prior to CC. In the control group ($n = 106$, mean age 67.1 years) standard care and information but no additional psychological support was offered. Sedatives including benzodiazepines were used rarely and in the same amount in both groups. The degree of anxiety was measured by objective standard state-anxiety-inventory test (STAI) prior and after CC in all patients (scale from 20 to 80; the range from 20 to 30 is regarded as anxiety-free interval).

Results Prior to CC, state anxiety as measured by STAI was 54.8 ± 11.5 (mean $\pm$ SD) in the control group and 54.8 ± 12.6 in the psychological support group. After CC, STAI was 47.9 ± 18.5 in the control group but 28.3 ± 12.5 (within anxiety-free interval) in the psychological support group ($p < 0.01$ vs. control). Furthermore, state anxiety in patients undergoing CC was influenced significantly by the severity of pathology of coronary artery disease and whether or not a coronary intervention was performed or planned. Those patients who received benzodiazepines in the evening before CC revealed no benefit by objective evaluation of state anxiety.

Conclusion Psychological support including RSA biofeedback is an effective and simple tool for the reduction of anxiety, fear and emotional stress in patients undergoing CC for evaluation of coronary artery disease. Implementation of these psychological tools in the daily routine of CC may help to further improve the acceptance of this important invasive procedure by the patients. Extent and content of psychological support need to be further studied.

Sitzung IV – Diverse 2

IV-1

055

N-Terminal Pro-Brain Natriuretic Peptide Predicts Exercise Tolerance in Heart Transplantant Recipients

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Introduction The diagnostic value of N-terminal pro-brain natriuretic peptide (NT-proBNP) after heart transplantation (HTx) is still incompletely understood. As certain graft factors (e. g. diastolic dysfunction) may affect both, cardiac synthesis of BNP and functional performance, we hypothesised a relationship between exercise variables and NT-proBNP levels after HTx.

Patients and Methods 105 asymptomatic HTx recipients (92 m, 13 f; aged 59 ± 10 yrs; donor age 33 ± 11 yrs; 88 ± 52 months after HTx; body mass index 27 ± 4 kg/m²; cyclosporin/sirolimus/tacrolimus 68/19/13 %) were studied. From April 2004 to June 2005 120 graded symptom-limited bicycle exercise tests and NT-proBNP assays (by Roche Diagnostics, Austria) were performed.

Results Mean exercise tolerance was 74 ± 17 % predicted normal (0–49 %: $n = 10$; 50–69 %: $n = 37$; 70–84 %: $n = 38$; 85–115 %: $n = 35$). Peak systolic blood pressure and heart rate were 184 ± 27 mmHg and 140 ± 19 bpm, respectively. Median resting NT-proBNP level was 282 pg/ml (25th–75th percentile 132–584; range 29–4143 pg/ml). Log-transformed NT-proBNP levels correlated inversely with exercise tolerance ($r = -0.23$; $p = 0.011$), peak systolic blood pressure ($r = -0.38$; $p = 0.0001$) and peak heart rate ($r = -0.25$; $p = 0.004$) and directly with time after HTx ($r = +0.30$; $p = 0.001$).

Conclusion Our data – confirming earlier results of a time dependent rise in NT-proBNP levels late after HTx – demonstrate that increased endocrine activity of the transplanted heart is associated with limited exercise tolerance, and hence, corresponding key exercise variables. By that a role of myocardial versus extracardiac factors in limiting fitness in HTx recipients is suggested.

IV-2

094

Plasma NT-proBNP Levels Predict Mortality in Patients with Cardiogenic Shock

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Introduction Plasma N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels are massively elevated in critically ill patients requiring respiratory and/or circulatory support. Recently it has also been shown that NT-proBNP levels are elevated in patients with severe sepsis and that this peptide might reflect temporary ventricular dysfunction in septic shock. However, NT-proBNP levels have not been investigated in patients with cardiogenic shock (CS) nor is it known whether NT-proBNP has prognostic potential in this clinical setting.

Methods Plasma levels of NT-proBNP (Roche Diagnostics, Austria) were determined in blood samples of 48 patients with CS collected at admission to the coronary care unit.

Results Median of NT-proBNP levels was 12,579 pg/ml (IQ range 5633 pg/ml–23,449 pg/ml) 15.3 ± 9.8 hours after the onset of shock. NT-proBNP showed no significant correlation with duration of shock, renal SOFA score, total SOFA score or the presence of SIRS at blood sampling. In linear regression analysis, none of the haemodynamic parameters were significant determinants of NT-proBNP levels, while eGFR contributed significantly to variation of NT-proBNP levels ($p < 0.001$). Kaplan-Meier survival analysis revealed that patients with NT-proBNP levels below median had significantly better survival than patients with NT-proBNP above this cut-

off ($p = 0.002$). In multivariate Cox analyses – adjusted for clinical, laboratory and haemodynamic parameters – NT-proBNP was a strong predictor of 30-days mortality ($p = 0.012$).

Conclusion In the present study we could show that duration of shock, extent of organ failure and haemodynamic parameters are no significant determinants of elevated NT-proBNP levels in CS. Nevertheless, survival of patients with CS is dramatically impaired when NT-proBNP is massively elevated early after the onset of shock.

IV-3

051

Analysis of a Neurobiochemical Marker Pattern Under Various Conditions of Non-Rheumatic Atrial Fibrillation

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Recently, the potential of a neurobiochemical marker panel in the diagnosis and monitoring of ischaemic cerebral stroke has been described. Atrial fibrillation is known to be associated with cerebral microembolism. We prospectively performed blood sampling and consecutive parallel analysis of 6 neurobiochemical marker proteins (Secretagogin – SEC, S100B, neuropeptide Y – NPY, brain fatty acid binding protein – BFABP, matrix metalloproteinase 9 – MMP-9, brain natriuretic peptide – BNP) in patients suffering from atrial fibrillation. Additionally, D-Dimer levels were determined. When cardioversion occurred (spontaneous, electric shock, pharmacological) blood samples were serially obtained thereafter. Throughout the observation period, only SEC, S100B and NPY exhibited a significant correlation. In the group of patients already receiving dose-adjusted coumarin on admission, the highest percentage of patients testing negative for these parameters was found. Except a slight decrease in the concentration of MMP-9 ($p < 0.001$), external cardioversion had no relevant influence on the mean neurobiochemical marker concentrations. Remarkably, a small number of clinically silent patients exhibited highly elevated serum concentrations of distinct markers. Two patients suffered from atrial fibrillation associated transient ischaemic attacks, which were paralleled by a marked increase of SEC, S100B and NPY. The comparison of magnetic resonance morphological findings with the neurobiochemical marker pattern revealed no correlation between the serum markers and MR-morphology.

In conclusion, our data describe for the first time the neurobiochemical marker pattern in patients suffering from atrial fibrillation. Intermittently elevated neurobiochemical markers in association with atrial fibrillation have to be considered in future studies using one of the analysed serum marker proteins.

IV-4

102

The Impact of Diabetes and BNP Values on the ICD Activation Incidence

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Background Reports in different literature have shown, that patients with elevated NT-proBNP levels have poor prognosis and are at high risk of sudden cardiac death (SCD). We consequently collected data on patients with implanted cardioventricular defibrillator (ICD) and incidence of ICD activations with the presence of NT-pro-BNP levels and diabetes.

Method Between 2004 and March 2006 57 patients were included into this analysis (15 % females). Oral glucose tolerance test, HbA1c and NT-proBNP were measured during a routine ICD follow-up.

Results Mean age at time of first ICD implantation was 59 ± 12 years. The underlying cardiac diseases were (1) coronary heart disease ($n = 32$); (2) dilative cardiomyopathy ($n = 15$); and (3) other cardiac disease as valvular heart disease, Brugada syndrome, Long-QT, and ARVD ($n = 10$), respectively. Mean NT-proBNP level of the entire population was 2,129 pg/ml (percentiles 25/370,50/1195) (Table 2). We divided this population in tertiles of subgroups of NT-proBNP as shown in Table 3.

Table 2: D. Haoula et al.

ICD activations	Yes	No	p-value
Mean Fasting Blood Glucose	110 mg/dl	114 mg/dl	0,58
Mean Hb _{A1c}	6 %	6,6 %	0,19
Mean NT-proBNP	1972 pg/ml	2245 pg/ml	0,15

Table 3: D. Haoula et al.

NT-proBNP	1 st Tertile (15–505 pg/ml)	2 nd Tertile (506–811 pg/ml)	3 rd Tertile (> 811 pg/ml)	p-value
% of Hb _{A1c} > 7	4	9	3	0.33
% of ischaemic heart disease in	67	57	42	0.25
% of dilative cardiomyopathy	6	37	26	0.06
other cardiac diseases	27	6	32	0.10
% of patients with ICD activation	50	45	31	0.48

As illustrated, no significant difference in subgroups concerning diabetes, ischaemic heart disease, and ICD activation could be demonstrated, with respect to NT-proBNP.

Conclusion In this small study population NT-proBNP levels were no predictor of recurrence of ventricular arrhythmias followed by adequate ICD activation. Interestingly, in our series lower NT-proBNP levels were (non significantly) associated with recurrent ICD activation.

IV-5

026

The Resting Heart Rate Is a Powerful Predictor of Future Vascular Events Among Women Undergoing Coronary Angiography

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Background Epidemiological data suggest that a high heart rate is associated with an increased risk of cardiovascular events. A potential gender difference in the impact of the heart rate on vascular risk has not yet been investigated.

Methods We obtained the resting heart rate from the electrocardiograms of a consecutive series of 622 patients (418 men and 204 women) who underwent coronary angiography for the evaluation of coronary artery disease. Prospectively, we recorded vascular events over 4 years.

Results The incidence of vascular events was 10.3 % among women and 21.1 % among men. The resting heart rate in the total study population proved significantly predictive of vascular events (standardised adjusted hazard ratio [HR] = 1.253 [95 %-CI 1.028–4.487]; $p = 0.025$). In subgroup analyses with respect to gender, the resting heart rate was a strong predictor of vascular events among women (HR = 1.790 [1.119–2.864]; $p = 0.015$), whereas it was not significantly associated with the incidence of vascular events in men (HR = 1.110 [0.884–1.392]; $p = 0.369$). An interaction term gender x resting heart rate was significant ($p = 0.044$), indicating a significantly stronger impact of the heart rate on the incidence of vascular events among women than among men.

Conclusions The resting heart rate is a powerful predictor of future vascular events among women undergoing coronary angiography that should be considered in routine cardiovascular risk stratification.

IV-6

062

Atrial Fibrillation Is a Strong Predictor of Death and Cardiac Events in Angiographed Coronary Patients

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Background No data on the prognostic impact of atrial fibrillation in angiographed coronary patients are available.

Methods In a consecutive series of 622 patients (418 men and 204 women) who underwent coronary angiography for the evaluation of established or suspected coronary artery disease we evaluated electrocardiograms according to the Minnesota Code. Prospectively, all-cause mortality, cardiac death (including fatal myocardial infarction, sudden cardiac death, and death from congestive heart failure due to coronary artery disease, and major coronary events (including death due to coronary heart disease, and non fatal myocardial infarction) were recorded over 4 years.

Results From our patients, 37 (5.9 %) at baseline had atrial fibrillation, 576 (92.7 %) exhibited sinus rhythm, 4 (0.6 %) had persistent supraventricular rhythms, and 5 (0.8 %) pacemaker rhythms. Presence of atrial fibrillation was associated with a lower prevalence of significant coronary stenoses with narrowing of at least ≥ 50 % at the baseline angiography (adjusted odds ratio = 0.121 [95 %-CI 0.051–0.289]; $p < 0.001$). Prospectively, however, patients with atrial fibrillation were at a strongly increased risk of all-cause mortality (adjusted hazard ratio [HR] = 4.529 [2.070–9.911]; $p < 0.001$), cardiac death (HR = 7.239 [2.569–20.399]; $p < 0.001$), and major coronary events (HR = 4.529 [2.070–9.911]; $p < 0.001$).

Conclusions Atrial fibrillation is inversely associated with the presence of angiographically diagnosed coronary artery disease, but is a strong predictor of death and cardiac events in angiographed coronary patients.

IV-7

028

Synergistic Effects of the Cholesterylester Transfer Protein TaqIB, the Apolipoprotein E E2/E3/E4, and the Apolipoprotein C3 –482 C > T Polymorphisms on the Risk of Coronary Artery Disease

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Background The genes encoding for cholesterylester transfer protein (CETP), apolipoprotein E (APOE), and apolipoprotein C3 (APOC3) play key roles in lipid metabolism. Their frequent variants CETP TaqIB B1 > B2, APOE E2/E3/E4, and APOC3 –482 C > T are associated with atherogenic dyslipidemia and – in some studies – with the risk of coronary artery disease (CAD). A potential synergistic effect of these polymorphisms on the risk of CAD has not yet been investigated.

Methods We analysed the CETP TaqIB, the APOE E2/E3/E4 and the APOC3 –482 C > T polymorphisms by 5' nuclease assay in 557 patients undergoing coronary angiography for the evaluation of established or suspected CAD. Significant CAD was defined as the presence of coronary stenoses with narrowings of at least ≥ 50 %.

Results From our patients, 129 carried the APOE E4 allele, 278 the APOC3 –482T allele and 196 the CETP B1B1 genotype. After multivariate adjustment, presence of the APOE E4 allele proved significantly associated with an increased risk of significant CAD (1.589 [95 %-CI 1.013–2.491]; $p = 0.044$); the respective odds ratios associated with the APOC3 –482T allele and the CETP B1B1 genotype were 1.170 [0.813–1.686]; $p = 0.398$ and 1.453 [0.985–2.142]; $p = 0.059$, respectively. Importantly, the risk of significant CAD was strongly increased in patients with more than one of the analysed genetic variants: adjusted odds ratios were 1.831 [1.113–3.013]; $p = 0.017$ for patients with both the APOE E4 allele and the CETP B1B1 genotype, 1.983 [1.017–3.868]; $p = 0.045$ for patients with both the APOE E4 and the APOC3 –482T alleles, 2.498 [1.474–4.231]; $p = 0.001$ for patients with both the CETP B1B1

genotype and the APOC3 –482T allele, and 4.491 [1.222–16.499]; $p = 0.028$ for patients with all three variants.

Conclusions There are strong synergistic effects of the CETP TaqIB, APOE E2/E3/E4 and APOC3 –482 C > T polymorphisms on the risk of angiographically diagnosed CAD.

Sitzung V – Interventionelle Kardiologie 1

V-1

086

Taxus-Stents for Treatment of Multivessel Disease: Preliminary 6-month Clinical and Angiographic Results of the Multicenter Austrian Taxus Multivessel Registry

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Purpose Randomised trials including patients with multivessel disease undergoing complete percutaneous intervention (PCI) with bare stent implantations reported similar or worse long-term outcome of PCI as compared with coronary artery bypass surgery. The aim of the present on-going multicenter Austrian Taxus Multivessel Registry is to investigate the long-term clinical and angiographic outcome of patients with multivessel disease after implantations of taxus-eluting stents, in a „real world setting“.

Methods Between June 2004 and June 2005, 327 consecutive patients with symptomatic multivessel coronary artery disease have been prospectively included in the Registry in one of the 8 Austrian high-volume PCI centres. Until January 2006, 195 patients have been controlled clinically and 175 of them underwent control coronary angiography mean 6 months after stent placements. The primary clinical endpoint of the study was defined as the freedom from major adverse cardiac events (MACE, defined as non-fatal MI, death and target vessel revascularisation [TVR]). Baseline and follow-up (FUP) quantitative angiographic parameters as in-stent and in-lesion (defined as lesion within 5 mm proximal or distal from stent edge) minimal lumen diameter (MLD), reference diameter (RD), and % diameter stenosis (% DS) were measured. Acute lumen gain (ALG), and in-stent and in-lesion late lumen loss (LLL) (MLD post-stenting minus MLD at FUP) was calculated.

Results The mean age of the patients was 65 ± 12 years, with 65 % male. Three-vessel disease was documented in 181 patients, 2-vessel disease in 146 patients. Total 1084 taxus stents were implanted (2.6 lesion/patient) with a stent/lesion ratio of 1.3. The stent/patient ratio was 3.3 ± 1.8 . An acute lumen gain of 1.54 ± 0.45 mm could be achieved, with a procedural success rate of 99 %. Neither acute nor subacute stent thrombosis occurred. During the long-term follow-up, the incidence of AMI was 0.5 %, repeat TVR was necessary in 9.2 % of the controlled patients, death occurred in 1 %. The 6-month overall freedom from MACE was 89.3 %. The binary in-stent restenosis of the angiographically controlled 441 lesions was 11.3 %; an in-stent LLL of 0.21 ± 0.65 mm was measured, and the in-lesion LLL was -0.05 ± 0.22 mm.

Conclusions Multivessel taxus stents implantation can be safely performed on patients with complex coronary artery disease. The need for revascularisation increases because of the cumulative effect of target lesion reintervention, on patients with multiple lesions.

V-2

110

Coronary In-Stent Restenosis of Drug-Eluting Stents Is Associated with Serum Levels of the Complement Component C5a

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Background Inflammation is a hallmark in the development of recurrent luminal narrowing after coronary stent implantation. Although, drug-eluting stents (DES) are associated with a reduced rate of in-stent restenosis (ISR), it still plays a significant role in the long-term outcome after PCI. As the complement component C5a exerts strong chemotactic and pro-inflammatory effects, we examined the association of serum levels of C5a and ISR after implantation of DES.

Methods We included 75 patients. Blood samples were taken directly before and 24 hours after PCI with DES implantation. Serum levels of C5a were measured by specific ELISA. Restenosis was evaluated at 6 to 8 months by coronary angiography.

Results During the follow-up period, 2 patients (2,7 %) died of cardiovascular causes and 12 patients (16 %) developed ISR. Patients with ISR at follow-up (16 %) showed significantly higher serum levels of C5a at baseline (37 ± 18 vs. 50 ± 27 ng/mL; $p < 0.05$). In contrast to C5a levels after PCI, C5a levels before PCI correlated significantly with late lumen loss ($r = 0.27$; $p < 0.05$). Multiple regression analysis revealed that this association was independent from stent diameter, stent length and presence of diabetes.

Conclusion Enhanced complement activation as measured by higher levels of C5a were significantly associated with ISR after implantation of DES. Pathways of complement inhibition thus may be worth being investigated with respect to improving patency rates.

V-3

049

Die Behandlung von Instent-Restenosen mit Drug-eluting-Stents: Vergleich von Diabetikern mit Nichtdiabetikern

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Einleitung Die wesentliche Limitation der koronaren Stentimplantation im Langzeitverlauf, insbesondere bei Patienten mit Diabetes, ist die hohe Rate an Instent-Restenosen (ISR). Mehrere Studien haben gezeigt, daß Drug-eluting-Stents (DES) in der Lage sind, die Restenoserate deutlich zu senken. Kaum Daten gibt es über die Behandlung von ISR bei nichtbeschichteten Stents mittels Implantation eines DES. Ziel unserer Untersuchung war es, den klinischen und angiographischen Verlauf nach Implantation von DES zur Behandlung von ISR bei Diabetikern (DM) und Nichtdiabetikern (NDM) zu untersuchen.

Methoden und Ergebnisse Im Zeitraum von Februar 2002 bis März 2005 wurden 327 ISR angiographisch dokumentiert. 61 Patienten (P) wurden aufgrund der gegebenen Gefäßmorphologie (kleines Gefäß, diffuse Sklerose oder langstreckiger Stentverschluß) mittels Ballondilatation alleine oder konservativ oder bei klinisch relevanter Progression in zusätzlichen anderen Gefäßgebieten mittels Bypasschirurgie behandelt. Die übrigen 266 P wurden entsprechend eines wissenschaftlichen Protokolls im Sinne einer „Intention-to-treat“ mittels Implantation eines DES behandelt und bildeten das vorliegende Studienkollektiv. 76 (28 %) dieser P waren DM und 190 NDM. Das mittlere Alter bei DM betrug 67 ± 10 vs. 69 ± 10 Jahre bei NDM. Der mittlere Stenosegrad (71 ± 15 % bei DM vs. 70 ± 15 % bei NDM), der mittlere Durchmesser der Stenose (MLD) ($0,7 \pm 0,4$ mm bei DM und $0,8 \pm 0,5$ mm bei NDM) und die Länge der Stenose ($19,7 \pm 14$ mm bei DM vs. $18,7 \pm 11$ mm bei NDM) waren statistisch nicht signifikant unterschiedlich. Pro ISR wurde jeweils nur ein Stent implantiert. Bei 24 P (31 %) der DM vs. 58 P (30 %) der

der NDM wurde der Stent ohne Ballonvordehnung implantiert. Die Stentlängen betrugen im Mittel $21,1 \pm 6,7$ mm bei DM vs. $19,2 \pm 6,6$ mm bei NDM, der mittlere Durchmesser $2,8 \pm 0,3$ mm vs. $2,8 \pm 1,1$ mm. Der Reststenosegrad nach Stentimplantation betrug im Mittel $11,8 \pm 13$ % bei DM vs. $11,7 \pm 10$ % bei NDM bei einem MLD von $2,5 \pm 0,6$ mm bei DM und $2,5 \pm 0,5$ mm bei NDM. Eine angiographische Kontrolle war nach 6 Monaten vorgesehen. 3 P (3,9 %) mit Diabetes verstarben im Beobachtungszeitraum. Ein P erlitt 2 Tage nach der Intervention eine Stentthrombose, die trotz erfolgreicher Reintervention nach der zweiten Intervention zum Pumpversagen führte. Die 2 anderen P verstarben 2 bzw. 4 Monate nach Intervention im Pumpversagen an chronischer Herzinsuffizienz ohne objektiven Hinweis auf eine Koronarischämie. Es konnten 198 P (74,4 %), 61 DM und 137 NDM, angiographisch und der Rest klinisch nachkontrolliert werden. Bei 11 P (14,4 %) der DM und bei 13 P (6,8 %) der NDM kam es nach 6 Monaten erneut zum Auftreten einer Instent-Restenose. Ein „Major Adverse Cardiac Event“ (Kardialer Tod, Myokardinfarkt, Revaskularisation Zielgefäß, Revaskularisation anderes Gefäß) trat bei 16 P (21 %) in der DM-Gruppe und 19 P (10 %) in der NDM-Gruppe auf.

Schlußfolgerungen Gegenüber der konventionellen Behandlung von ISR profitieren von der Implantation von DES sowohl NDM- als auch DM-Patienten. In Analogie zur Implantation von DES in *De-novo*-Stenosen ist das Risiko einer neuerlichen ISR bei DM etwa doppelt so hoch wie bei NDM.

V-4

043

Die Behandlung von Instent-Restenosen in Venenbypässen mit Drug-eluting-Stents – ein Single-Center-Erfahrungsbericht

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Einleitung Eine Vielzahl großer randomisierter Studien belegt den Stellenwert von medikamentös beschichteten Stents (DES) in der Behandlung von *De-novo*-Koronarstenosen. Kaum Daten gibt es über die Verwendung von DES zur Therapie von Instent-Restenosen. Eine noch weniger untersuchte Untergruppe stellen Instent-Restenosen in Venenbypässen dar. Ziel unserer Untersuchung war es, den angiographischen und klinischen Verlauf nach Revaskularisation einer Instent-Restenose in einem Venen-Bypass mittels DES zu untersuchen.

Methoden und Ergebnisse 31 Patienten (6 Frauen, 25 Männer, mittleres Alter 71 [58–91] Jahre), davon 23 (74 %) Patienten (Pat.) mit Hypercholesterinämie, 27 (87 %) Hypertoniker und 2 (6 %) Diabetiker, mit einer Instent-Restenose (mittlerer Stenosegrad 79 ± 11 %) in einem Venenbypass (mittleres Alter des Venenbypasses $16,4 \pm 6,7$ Jahre, mittlerer Zeitraum seit Stentimplantation $1,6 \pm 1,7$ Jahre), mittlerer Durchmesser der Stenose (MLD) $0,6 \pm 0,3$ mm, und einer CCS-Klasse von $2,8 \pm 0,9$ wurden mittels Stent-in-Stent-implantation behandelt. Bei 16 (52 %) Pat. wurde der Bypass zum R. interventricularis anterior interveniert, bei 8 (26 %) Pat. der Bypass zur rechten Koronarie, bei 5 (16 %) Pat. der Bypass zum R. circumflexus und bei 2 (6 %) Pat. der Bypass zum R. diagonalis. Bei 10 (32 %) Pat. erfolgte eine primäre Stentimplantation, bei 21 (68 %) Pat. erfolgte die Stentimplantation nach Ballonvordehnung. In der Annahme einer Bindegewebshyperplasie als Restenosemechanismus erfolgte bei der Mehrzahl der Patienten keine distale Protektion mittels Filterdevice. Lediglich bei 2 (6 %) Pat. wurde aufgrund der angiographischen Oberflächenirregularität der Stenose ein Filterdraht verwendet. Wir implantierten bei 17 (55 %) Pat. einen Cypher-Stent™ (Cordis), bei 11 (35 %) Pat. einen Taxus-Stent™ (Boston Scientific) und bei 3 (10 %) Pat. einen Endeavorstent™ (Medtronic). Die Stentlängen betrugen im Mittel $19,2 \pm 5,1$ mm bei einem mittleren Durchmesser von $3,09 \pm 0,3$ mm. Durch die Stentimplantation konnte eine effektive Lumenerweiterung („acute gain“) von $2,12 \pm 0,76$ mm erreicht werden. Der Restenosegrad nach Stentimplantation betrug im Mittel $6,8 \pm 9$ % bei einem MLD von $2,72 \pm 0,78$ mm. Der postinterventionelle Verlauf war in den ersten 30 Tagen bei allen Patienten komplikationslos. Das Follow-up erfolgte nach durchschnittlich $8,7 \pm 5,6$ Monaten, wobei 20 (64 %) der

Pat. nachangiographiert wurden und bei 4 (13 %) Pat. eine klinische Kontrolle erfolgte. Die restlichen 7 (23 %) Pat. haben die 6-Monatskontrolle noch nicht erreicht. 6 Monate nach Intervention war ein Patient an einer Endokarditis verstorben und bei einem Patienten trat ein akutes Koronarsyndrom im Rahmen einer Restenose auf. Der MLD im Rahmen der angiographischen Kontrolle betrug $2,09 \pm 1,13$ mm bei einem Restenosegrad von $34,3 \pm 26,2$. Der „late lumen loss“ betrug $0,8 \pm 1,2$ mm. 5 (25 %) Pat. entwickelten eine signifikante Restenose (> 50 %), bei einer CCS-Klasse bei der Kontrolle von im Mittel $2,7 \pm 0,8$.

Schlussfolgerung Die Behandlung einer In-stent-Restenose in einem Venenbypass mit DES ist technisch durchführbar und scheint auch ohne distale Protektion sicher zu sein. Weitere Untersuchungen sind jedoch notwendig, um Langzeitergebnisse hinsichtlich der Effektivität im Vergleich zu alternativen Therapieverfahren zu erlangen.

V-5

072

Bifurkationsstenting: ein Bench-Modell

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Hintergrund Interventionelle Techniken werden zunehmend komplexer. Insbesondere Bifurkationsstenosen stellen eine große Herausforderung dar. Zufriedenstellende Ergebnisse werden nur durch die geeignete Stentstrategie und -technik erzielt. Ein Stent-Bench-Modell im Sinne eines Simulators ist daher eine wichtige Schulungs- und Trainingshilfe.

Methoden An einem Stent-Bench-Modell (Koronarbaum mit unterschiedlichen Bifurkationswinkeln aus extrudiertem Polystyrol) wurden komplexe Interventionen wie Kissing-Balloninflation, Modified-T-Stenting und diverse Crush-stenting-Varianten durchgeführt.

Ergebnisse Die jeweiligen Techniken werden Schritt für Schritt durchgeführt und dokumentiert. So gelingt eine detaillierte Analyse und ein Vergleich der einzelnen Techniken. Zusätzlich werden typische Problembereiche dargestellt, insbesondere ungenügendes ostiales Scuffolding am Seitenast, Stent-Distortion im Hauptast, Stentabdeckung der Bifurkation bei T-Stenting, ostialer Strutdurchmesser am Seitenast. Darüber hinaus erlaubt das Bench-Modell, das Verhalten unterschiedlicher Stents in diesem Setting zu studieren. Im Rahmen der Kardiologientagung werden wir verschiedene typische Szenarien demonstrieren.

Konklusion Ein Stent-Bench-Modell stellt eine wichtige Schulungs- und Trainingshilfe zur Durchführung komplexer Interventionen dar.

V-6

010

Randomised Comparison Between Intracoronary Beta-Radiation Brachytherapy and Implantation of Paclitaxel-Eluting Stents for the Treatment of Diffuse In-Stent Restenosis (Final Results)

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Background Intracoronary brachytherapy was the primary therapeutic option for the treatment of in-stent restenosis (ISR) during the last years. Especially for the treatment of diffuse ISR (lesions > 10 mm), beta-source brachytherapy was significantly superior to singular balloon angioplasty. On the other hand, despite of lacking clinical database, the implantation of drug eluting stents became a common procedure for the treatment of ISR during the last two years.

Objective This randomised trial aimed to compare the efficacy of beta-brachytherapy with beta-radioisotopes ⁹⁰Sr/⁹⁰Y (Beta-Cath™,

Novoste Corp.) and paclitaxel-eluting stent implantation (Taxus-Express2™, Boston Scientific Corp.) for the treatment of diffuse ISR.

Methods 37 patients with diffuse ISR were randomly assigned to beta-brachytherapy after balloon angioplasty (17 patients) or paclitaxel-eluting stent implantation (20 patients). Six-month clinical follow-up was obtained for all patients, while angiographic follow-up was available for 30 patients.

Results Binary ISR (restenosis > 50 %) within target segment was observed in 3 patients treated with Beta-Cath™, of which one needed target segment revascularisation for recurrent ISR, whereas no significant restenosis occurred in the patients treated with Taxus-Express2™ ($p = 0.037$). No further major adverse cardiac event (target vessel revascularisation, myocardial infarction, death) was found in both groups ($p = n. s.$). Stent implantation was the more time-saving (31 ± 11 min versus 60 ± 23 min, $p < 0.001$) procedure.

Conclusion Although this trial revealed a significant reduction of binary restenosis, we found no difference in clinical outcome after implantation of a paclitaxel-eluting stent for the treatment of diffuse ISR when compared to beta-brachytherapy.

V-7

007

Duration of Development of Symptomatic In-Stent Restenosis Correlates with Stent-to-Vessel Diameter Ratio

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Background Several predictors for in-stent restenosis (ISR) have been defined by intravascular ultrasound (IVUS) assessment, however there is lack of data correlating IVUS parameters with the speed of development of ISR. This study aimed to investigate the relation between the duration of development of symptomatic ISR and the relative stent diameter.

Methods 46 lesions in consecutive 43 patients with symptomatic ISR were investigated by IVUS with the Endosonics™ system. Duration of development of symptomatic ISR was determined by the period of angiographic evidence for ISR. Early ISR was defined in case of occurrence before 6 months. Relative stent diameter was defined by the stent-to-vessel diameter ratio (SVDR).

Results Mean duration of symptomatic ISR was 10.3 ± 11.5 months for all 46 lesions. Early ISR was observed in 25 lesions (54 %). Multivariate analysis revealed SVDR as the only independent predictor for early ISR ($p = 0.0242$). Significant correlation was observed between duration of development of symptomatic ISR and SVDR ($r = 0.634$, $p < 0.001$). Based on receiver operating curve analysis, relative stent diameter was defined as small when $SVDR \leq 0.90$. Symptomatic ISR within stents of small relative diameter occurred significantly earlier (5.3 ± 3.0 months vs. 16.7 ± 15.0 months, $p < 0.001$) and more frequently before 6 months (73 % vs. 30 %, $p = 0.003$) than in stents with $SVDR > 0.90$ (Figure 5).

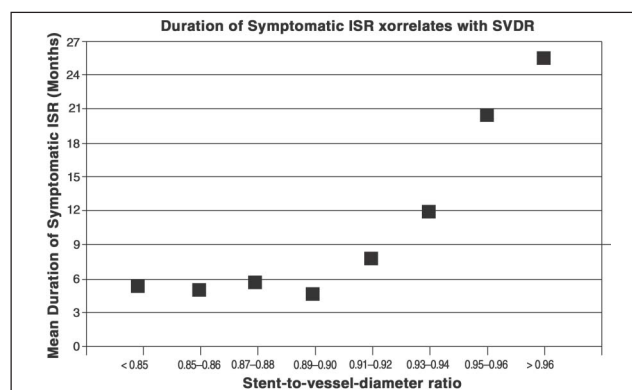


Figure 5: Ch. Schukro et al.

Conclusion This IVUS study revealed significant correlation between the duration of development of symptomatic ISR and SVDR, which was an independent predictor for early ISR. IVUS-guided stenting may avoid early in-stent restenosis by adapting the stent diameter to the vessel diameter.

V-8

041

Vergleich von Patienten mit Akut-PCI mit und ohne Wiedererlangung eines TIMI-III-Flusses

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Einführung Die Akutintervention (Akut-PCI) beim akuten ST-Hebungsinfarkt gilt als Behandlungsmethode erster Wahl. Nicht immer ist es möglich, durch den Eingriff einen TIMI-III-Fluß herzustellen.

Patienten und Methodik Insgesamt wurde eine konsekutive Serie von 369 Patienten (P) einer Akut-PCI unterzogen. Standardmäßig wurden unsere Patienten vor dem Eingriff mit ASS 500 mg und 300 mg Clopidogrel sowie einem gewichtsadaptierten Bolus Abciximab behandelt. Bei prähospital erfolgter systemischer Lyse wurde kein GPIIb/IIIa-Antagonist verabreicht. 6 Monate nach erfolgter PCI wurden die Patienten schriftlich zu einer ambulanten Nachkontrolle an unser Zentrum eingeladen.

Ergebnisse Insgesamt wurde bei 59 P (16 %), davon 42 P männlich (71 %), mit einem Durchschnittsalter von 65 ± 14 Jahren kein TIMI-III-Fluß erreicht (Gruppe 1). Dabei war bei 11 P eine Intervention technisch nicht erfolgreich (19 %). Bei 310 P (84 %), davon 230 P männlich (74 %), mit einem Durchschnittsalter von 62 ± 14 Jahren konnte ein unbehinderter TIMI-III-Fluß wiederhergestellt werden (Gruppe 2). 17 % (10 P) der Gruppe 1 sowie 0,8 % (25 P) der Gruppe 2 wurden prähospital lysiert ($p = 0,02$), die Schmerzdauer lag bei 345 ± 579 in Gruppe 1 sowie bei 268 ± 518 Minuten in Gruppe 2 ($p = n. s.$). Die intrahospitale Mortalität der Gruppe 1 lag bei 32 % (19 P), die Spätmortalität bei 5 % (3 P). In Gruppe 2 lag diese bei 7 % (21 P; $p < 0,000001$) respektive bei 4 % (12 P; $p = n. s.$). Die Ergebnisse des 6-Monats-Follow-up waren in den beiden Gruppen statistisch nicht signifikant unterschiedlich: 53 P der Gruppe 1 (90 %) vs. 287 P der Gruppe 2 (93 %) konnten nachkontrolliert werden. Der klinische Verdacht auf eine Restenose lag bei 39 % (12 P) der kontrollierten P in Gruppe 1 ($n = 31$), sowie bei 40 % (101 P) der kontrollierten P der Gruppe 2 ($n = 254$) vor. Die angiographische In-Stent-Restenoserate lag in der ersten Gruppe bei 13 % (4 P), in Gruppe 2 bei 16 % (41 P). Eine Intervention in einem anderen als dem akuten Zielgefäß der Primärintervention erfolgte bei 13 % der Gruppe 1 (4 P) sowie bei 7 % der Gruppe 2 (18 P).

Schlußfolgerung Bei Patienten, die prähospital lysiert wurden, wurde eine signifikant geringere TIMI-III-Flußrate erzielt als bei Patienten, die unmittelbar vor der Akut-PCI mit Abciximab behandelt wurden. Die Spitalsmortalität war bei TIMI-III-Fluß-Patienten signifikant geringer als bei jener Patientengruppe, in der kein TIMI-III-Fluß hergestellt werden konnte. Im 6-Monats-Follow-up zeigte sich jedoch keine Schlechterstellung jener P ohne TIMI-III-Fluß im Sinne von vermehrten Reangiographien oder Reinterventionen.

Sitzung VI – Pulmonale Hypertension

VI-1

077

Bosentan for Inoperable Chronic Thromboembolic Pulmonary Hypertension

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Background Bosentan, an oral endothelin ET_A/ET_B receptor antagonist, is effective in the short-term treatment of inoperable chronic thromboembolic pulmonary arterial hypertension (CTEPH). We investigated haemodynamics, safety and efficacy of bosentan therapy at one year of therapy in 21 patients (13 ♀/8 ♂, mean age 71 ± 12 years) who were treated off-label over 16 ± 6 months.

Results After one year of treatment, NYHA functional class had improved by one class in 14 patients. Mean six-minute walking distances increased from 299 ± 131 m at baseline to 387 ± 121 m ($p = 0.04$). In parallel, proBNP decreased from 3365 ± 2923 pg/ml to 1579 ± 2103 pg/ml ($p = 0.02$). Overall, mean pulmonary arterial pressure (mPAP) decreased from 48 ± 10 to 43 ± 12 mmHg ($p = 0.17$), pulmonary vascular resistance (PVR) changed from 653 ± 247 to 468 ± 205 dynes.s.cm⁻⁵ ($p = 0.04$). If haemodynamic non-responders to therapy were excluded ($n = 5$), mPAP decreased from 50 ± 10 to 42 ± 11 mmHg ($p = 0.17$), and PVR changed from 757 ± 232 to 420 ± 137 dynes.s.cm⁻⁵ ($p = 0.015$). Neither AST (25 ± 2 vs. 25 ± 2 U/l; $p = 0.25$) nor ALT (23 ± 12 vs. 24 ± 9 U/l; $p = 0.57$) changed significantly. Two deaths occurred from causes unrelated to pulmonary hypertension.

Conclusions Our study suggests a beneficial long-term effect of the oral dual endothelin receptor antagonist bosentan in patients with inoperable CTEPH. Non-responders to bosentan therapy must be further characterised.

VI-2

076

Exercise-Induced Pulmonary Hypertension in Patients After Successful Pulmonary Endarterectomy

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Background Pulmonary endarterectomy (PEA) provides potential cure for patients with chronic thromboembolic pulmonary hypertension (CTEPH). Successfully operated patients have been shown to normalise exercise capacity and haemodynamic parameters in long-term studies.

Methods To investigate whether pulmonary hypertension can be provoked by exercise, we studied patients at least one year after successful PEA with documented (near-) normalisation of exercise capacity and haemodynamics. Patients ($n = 13$) and age-matched non-pulmonary hypertensive controls ($n = 14$) underwent echocardiography at submaximal treadmill exercise.

Results Resting mean pulmonary arterial pressure was 25 ± 9 mmHg, mean pulmonary vascular resistance was 291 ± 148 dynes.s.cm⁻⁵, mixed venous saturation was 71 ± 5 % and mean cardiac output was 5.2 ± 1.1 l/min at 63 ± 31 (range 16–120) months after PEA. There was no difference in age (61 ± 10 vs. 57 ± 13 years; $p = 0.5$) or 6-minute walking distance (489 ± 114 vs. 456 ± 45 meters; $p = 0.32$) between patients and controls. While the difference in resting systolic pulmonary arterial pressures (sPAP) reached only borderline significance (41 ± 18 vs. 30 ± 6 mmHg; $p = 0.05$), there was a significant difference in exercise-sPAP (71 ± 23 vs. 46 ± 11 mmHg, $p = 0.001$), resting pulmonic valve acceleration time (102 ± 24 vs. 132 ± 17 ms; $p = 0.0008$) and serum BNP levels (207 ± 134 vs. 70 ± 77 pg/ml; $p = 0.007$).

Conclusions Patients with normal exercise capacity and resting haemodynamics after PEA demonstrate significant pulmonary hypertension at exercise. There is a need for studies investigating whether this patient population does additionally benefit from vasodilator therapies.

VI-3

058

L-Arginine and Asymmetrical Dimethylarginine (ADMA) in Chronic Thromboembolic Pulmonary Hypertension (CTEPH)

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Background Nitric oxide (NO) is synthesised from L-arginine by NO synthase, which can be inhibited by asymmetrical dimethylarginine (ADMA). ADMA is increased in idiopathic pulmonary hypertension (iPAH) and associated with unfavourable outcome. Chronic thromboembolic pulmonary hypertension (CTEPH) shows vascular hypertensive changes similar to iPAH. Therefore, we hypothesised that plasma levels of ADMA may be increased in patients with CTEPH.

Methods We collected data from 10 patients with iPAH and 28 patients with CTEPH (13 proximal and 15 distal). L-arginine and ADMA plasma levels were measured by high-performance liquid chromatography. All patients underwent right heart catheterisation. In addition, levels of ADMA were measured in 14 age- and sex-matched controls.

Results All patients had severe pulmonary hypertension (iPAH: MPAP 56 ± 11 mmHg, CI 2.2 ± 0.5 L $\times$ min⁻¹ $\times$ m⁻²; CTEPH: MPAP 51 ± 6 mmHg, CI 2.3 ± 1 L $\times$ min⁻¹ $\times$ m⁻²). There was no difference in haemodynamics between proximal and distal CTEPH. L-arginine plasma levels were significantly decreased in all patients with pulmonary hypertension. L-arginine plasma levels correlated significantly with mixed-venous saturation ($r = 0.48$; $p < 0.01$) and cardiac index ($r = 0.39$; $p < 0.05$). ADMA plasma levels were significantly elevated in distal CTEPH and iPAH patients (0.81 ± 0.22 μ mol/l and 0.69 ± 0.13 μ mol/l) compared with controls (0.52 ± 0.14 μ mol/l; $p < 0.05$, respectively). ADMA was significantly higher in distal CTEPH than in proximal CTEPH ($p < 0.01$).

Conclusions ADMA plasma levels are increased in CTEPH patients. The data confirm similar pathophysiologic mechanisms of vascular remodeling in iPAH and CTEPH.

VI-4

057

Survival in Patients with Inoperable CTEPH Treated with Subcutaneous Treprostinil

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Background Treprostinil improves exercise capacity, haemodynamics and signs and symptoms of pulmonary arterial hypertension (PAH). Inoperable CTEPH may be a target for vasodilator therapy.

Aim In an open-label uncontrolled study, we investigated efficacy and survival in patients with severe inoperable CTEPH treated with subcutaneous treprostinil.

Methods Between September 1999 and 2005, 25 consecutive inoperable CTEPH patients were treated with s. c. treprostinil. Inclusion criteria were New York Heart Association (NYHA) functional class III or IV and six-minute walking distance (6-MWD) ≤ 380 m. NYHA functional class, 6-MWD and B-type brain natriuretic peptide (BNP) served as primary efficacy endpoints. Right heart catheterisation was performed at baseline and after at least 12 months of treatment. A historical group of 31 untreated patients with inoperable CTEPH matched for NYHA functional class was used for comparative survival analysis.

Results Under treatment, patients demonstrated improvements in 6-MWD, NYHA functional class, and decreased BNP levels. 12 patients (age 55.4 ± 10 years) were catheterised after 25.4 ± 10 months at a final mean treprostinil dose of 37.7 ± 9.6 ng/kg/min demonstrating significant improvements of cardiac output $+0.7 \pm 1.0$ L $\times$ min⁻¹ ($p = 0.03$) and pulmonary vascular resistance -193 ± 287 dynes $\times$ s $\times$ cm⁻⁵ ($p = 0.02$). Overall survival rates of treprostinil-treated patients at one, two, three, and five years were 80 %, 80 %, 80 % and 53 %, respectively, compared with the untreated group (67 %, 43 %, 37 % and 16 %; $p = 0.02$). Treprostinil was an independent predictor of improved survival ($p = 0.02$).

Conclusions Subcutaneous treprostinil improves exercise capacity, haemodynamics and survival in patients with severe inoperable CTEPH.

VI-5

060

Prevalence of Pulmonary Hypertension in Patients with Plasma Lupus Anticoagulant

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Introduction Chronic thromboembolic pulmonary hypertension (CTEPH) is a common form of pulmonary hypertension (PH) that is characterised by the persistence of thromboemboli in major pulmonary arteries. Although traditional thrombosis risk factors are absent, plasma lupus anticoagulant (LAC) is detectable in approximately 20 % of cases. We conducted a prospective study to determine the prevalence of CTEPH in asymptomatic patients carrying plasma LAC. 71 LAC-positive patients were screened by resting transthoracic 2D and Doppler-echocardiography.

Results Patient age ranged from 22–82 years (median 44), body mass index was 17–49 (median 25.2), 14 males. 13 patients had suffered from pulmonary embolism, 35 had had a deep vein thrombosis, 4 had had a previous stroke. 45 patients were on coumadin and one on heparin at the time of the assessment. Mean 6-minute walk distance was 455 ± 100 m. PH was identified in 4 patients by an estimated systolic pulmonary artery pressure (sPAP) of 45, 60, 110 and 95 (median 78 mmHg). Two of these patients had suffered previous PE. PH was suspected in 3 further patients based on an increased left/right atrial diameter ratio of 0.8 ± 0.2 , in the absence of measurable tricuspid regurgitation signal. One of these three patients had had previous PE.

Discussion The prevalence of PH in carriers of LAC is less than 10 %. The data indicate that CTEPH pathogenesis is complex and involves factors beyond traditional thrombosis.

VI-6

061

Mismatch of Major Vessel Obstruction and Pulmonary Vascular Resistance (PVR) in Chronic Thromboembolic Pulmonary Hypertension (CTEPH) with Associated Medical Conditions (AMC)

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Background Patients with CTEPH and AMC, such as splenectomy, ventriculo-atrial shunt for the treatment of hydrocephalus, and chronic inflammation, appear to carry an unfavourable clinical course compared with CTEPH patients without AMC. We hypothesised that this phenomenon is due to secondary pulmonary vascular disease in AMC patients.

Methods We compared the degree of major vessel obstruction (no thrombus: 0, minor thrombus: 1, stenosis ≤ 70 %: 2, stenosis > 70 %: 3, occlusion: 4) in central, lobar and segmental pulmonary arteries scored on the basis of digital subtraction pulmonary angiography and invasively measured PVR in CTEPH patients with ($n = 17$) and without ($n = 71$) AMC.

Results While there was no difference in the degree of major vessel obstruction in AMC- (52 ± 16) versus non-AMC-patients (58 ± 15 ; $p = 0.25$), there was a significant difference in PVR (1022 ± 552 dynes.s.cm⁻⁵ vs. 725 ± 332 dynes.s.cm⁻⁵; $p = 0.04$).

Conclusions The adverse outcome reported in CTEPH patients with AMC may be attributed to secondary pulmonary vascular disease.

Sitzung VII – Rhythmologie 1

VII-1

011

Accuracy of Fusion of Multislice Computed Tomography Imaging with Three-Dimensional Electroanatomic Mapping for Real-Time Guided Radiofrequency Ablations

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Background Ostial/circumferential radiofrequency ablation at/around the orifices of the pulmonary veins is a potentially curative catheter-based therapy of paroxysmal and persisting atrial fibrillation. By fusion of computer-tomographic scans with real-time 3-D electroanatomy the ablation procedure may be optimised for the individual patient.

Objectives This study aimed to evaluate the accuracy and feasibility of fusion of multislice computed tomography (MSCT) with three-dimensional electroanatomic mapping to guide radiofrequency catheter ablation of atrial arrhythmias.

Methods Forty consecutive patients (34 male, age 56 ± 10 years) with multi-drug-refractory atrial fibrillation underwent 16-slice MSCT one day before radiofrequency catheter ablation. MSCT data was processed and imported to the Carto™ electroanatomic mapping system. Using the new CartoMerge™ Image Integration Module, the generated electroanatomic map was aligned with the MSCT images. An integrated statistical algorithm provided information about the accuracy of the fusion process. We also performed statistical analysis comparing matching precision in patients with sinus rhythm versus atrial fibrillation within the ablation as well as before versus after ablation procedure.

Results In every patient MSCT images could be aligned with the electroanatomic map. Mean distance between the mapping points and the MSCT surface was 1.6 ± 1.2 millimetres with no difference between the sinus rhythm versus atrial fibrillation groups ($p = 0.145$). An average of 379 ± 94 radiofrequency ablation points were taken within the procedures resulting in a mean distance of 2.3 ± 1.8 millimetres between the mapping points and the MSCT image after ablation. There was a significant difference of alignment accuracy before and after radiofrequency catheter ablation ($p < 0.001$).

Conclusion With the CartoMerge™ Image Integration Module MSCT images can be fused with the three-dimensional electroanatomic mapping system in an accurate manner. After radiofrequency catheter ablation the alignment accuracy gets worse, maybe due to tissue oedema or different catheter pressure, or the surface within mapping versus ablation procedure. Fusion of electroanatomic mapping and computer-tomographic scans should provide a further risk reduction of ablation therapy.

VII-2

030

Echocardiographic Characteristics of the Interatrial Septum in Patients Undergoing Ablation for Atrial Fibrillation

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Background Atrial fibrosis or fatty deposition are known to increase the propensity for the development of atrial fibrillation (AF).

The interatrial septal thickness and the presence of AF has been correlated previously. Apart from the pulmonary veins the interatrial septum (IAS) might play a role in the maintenance of AF. We investigated the characteristics of the IAS by transesophageal echocardiography (TEE) in patients (pts) who underwent radiofrequency ablation of AF.

Methods The study comprised 34 consecutive pts (mean age 54 ± 11 years; 29 male). AF was paroxysmal in 31 (91 %) pts and persistent in 3 (9 %) pts. Mean duration of AF was 5 ± 4 years. Arterial hypertension was present in 14 pts, structural heart disease in 2 pts, and a history of stroke in 2 pts. The left ventricular function was preserved ($EF > 0.55$) in the majority (90 %) of cases. All pts underwent a TEE (GE VingMed Vivid 5® Echocardiography System) the day before the procedure for exclusion of atrial thrombi despite oral anticoagulation. The IAS was investigated in multiple planes before and after injection of 10 ml echo contrast (agitated saline or HAES).

Results The mean left atrial diameter was 44 ± 5 mm. A slow left atrial velocity was noted in 4 (12 %) pts, but no thrombus was diagnosed in any of the pts. The IAS was structurally abnormal in 13 (38 %) pts, showing the following echocardiographic findings: an interatrial septal aneurysm ($n = 7$), an interatrial septal aneurysm with a patent foramen ovale (PFO) ($n = 2$) or combined with a small atrial septal defect ($n = 2$), abnormal thickening of the IAS ($n = 3$), lipomatous hypertrophy ($n = 1$), a septal flap ($n = 1$) and a PFO ($n = 1$).

Conclusion A structurally abnormal IAS was diagnosed in 38 % of pts undergoing ablation therapy for AF. The information obtained by TEE is mandatory to exclude left atrial thrombi prior to the ablation procedure. Moreover, detailed knowledge of the IAS and morphologic abnormalities facilitates the optimal and riskless performance of the double transseptal puncture using long sheaths. Finally, the presence of an interatrial septal aneurysm together with a PFO may have an influence on further patient management.

VII-3

031

Usefulness of Ipsilateral Angiographic Pulmonary Vein Imaging for Catheter Ablation of Atrial Fibrillation

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Introduction Knowledge of individual pulmonary vein (PV) anatomy is a common feature of the various approaches for catheter ablation of atrial fibrillation (AF). Ostial delineation has become an integral part of the segmental PV isolation procedure, particularly to avoid PV stenosis. The objective of this study was to test a refined angiographic technique for simultaneous PV imaging performed at the time of ablation.

Methods Thirty-one consecutive patients (pts) (29 males; age 53 ± 11 years) underwent PV isolation for symptomatic, drug-refractory AF. After two separate transseptal punctures the ipsilateral PVs were cannulated with long sheaths (Preface Multipurpose, 8-F, BW) using a deflectable ablation catheter as guidewire. Contrast angiography was performed by hand-injection of isoosmolar dye (Visipaque, GE) in standard biplane projections. Stored image frames served as road maps for proper sizing and positioning of Lasso catheters at atriovenous junctions.

Results Ipsilateral PVs were successfully visualised as pair in all cases. This technique was superior to the commonly used selective angiography of single PVs with diagnostic angiocatheters. A normal anatomic pattern with 2 right and 2 left PVs was seen in 25 pts (81 %). In 4 pts (13 %) a common trunk (3 left and 1 right), and in 2 pts (6 %) a middle PV (1 right posterior and 1 left) was detected. PV isolation of all 4 PVs was performed in 26 pts. Both superior and the left inferior veins were disconnected in 5 pts. During mean follow-up of 17 ± 15 months 16 pts (52 %) remained free of symptoms, 14 pts (45 %) experienced partial success requiring antiarrhythmic drugs, and 1 pt (3 %) had recurrence of persistent AF. Spiral CT at 4-month showed no PV narrowing in comparison to the baseline CT in any of the pts. Thereafter, no pt had symptoms suggestive of PV stenosis.

Conclusion The results of the study demonstrate that simultaneous angiography of adjacent PVs can be quickly and reliably performed using two long transseptal sheaths. This technique was effective for assessment of the individual anatomy including common ostia and supernumerary veins which can be easily missed by selective venography. Furthermore, this approach may help to reduce the risk of PV stenosis substantially.

VII-4

022

Incremental Benefit by Extending a Segmental Pulmonary Venous Ostial to an Extraostial Left Atrial Approach in the Ablation of Atrial Fibrillation

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Background Two distinct ablative strategies have been recently applied to treat various forms of atrial fibrillation (AF): Segmental ostial isolation (SOI) of the pulmonary veins (PV) from the left atrium versus extraostial substrate modification (SM) around the PVs. The incremental benefit of deploying lesions outside the tubular portion of the PVs is not completely understood.

Methods Pts. either underwent SOI or two forms of SM (with/without confirmation of PV isolation at the ostial level) in a single center experience from 2001 to 2005. Ablation technology remained unchanged throughout the whole follow-up (irrigated tip ablation, maximal energy output limited to 30 watts, 2 operators). Success was defined as complete elimination of AF with/without drug after a regular follow-up of 6 months.

Results 276 procedures were performed in 200 patients (pts) aged 53 ± 10 years (82 % male, 18 % female), including 116 pts (58 %) undergoing SOI and 84 pts (42 %) undergoing SM. AF was paroxysmal (PAF) in 81 % and chronic (CAF, including persistent and permanent AF) in 19 %. The mean number of procedures performed was higher in the SOI approach than in the SM (1.41 vs. 1.09; $p < 0.0001$). Success rates tended to be higher in SM compared to SOI for both PAF (86 and 89 % vs. 79 %) and for CAF (95 and 100 % vs. 82 %), however differences were not significant due to small sample size in the subgroups of SM (including pts with/without confirmed isolation of the PV at the ostial level). The rate of significant (> 50 %) PV stenosis after the last procedure was 11.5 % in total and similar within subgroups.

Conclusion SOI appears less effective than SM in the treatment of both PAF and CAF. The incremental benefit seems to be higher in CAF. Significantly more procedures were performed in the SOI approach. The benefit of additional confirmed isolation at the PV ostial level in SM remains undetermined. The occurrence of PV stenosis is similar across subgroups.

VII-5

044

Nervale Komplikationen bei Katheterablation – anatomische Grundlagen

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Einleitung Die Katheterablation mit Radiofrequenzstrom ist als etabliertes invasives Behandlungsverfahren von therapieresistenten Arrhythmien im Zunehmen und stellt bei vielen Rhythmusstörungen bereits das Verfahren der ersten Wahl dar. Dieses Verfahren ist allerdings mit zum Teil gravierenden Nebenwirkungen verbunden, welche der Literatur entsprechend zwischen 2,5 und 24 % liegen. Schwere Komplikationen wie permanente Zwerchfell-Lähmungen und Sprachstörungen, bedingt durch Verletzungen des N. phrenicus bzw. des N. recurrens. Im speziellen sind rechtsseitige Phrenikus- und linksseitige Rekurrensparesen beschrieben. Auch linksseitige Zwerchfell-Lähmungen als Folge einer Katheterablation bei Wolff-Parkinson-White-Syndrom wurden beschrieben. Ziel dieser Studie war es daher, die exakten topographischen Beziehungen dieser Nerven zum Herzen zu evaluieren.

Material und Methode In einer anatomischen Studie an 37 mit der Grazer Konservierungstechnik nach Thiel konservierten Leichen (19 männl., 18. weibl; 54–83 Jahre) wurde die Lage der Nn. phrenici und des N. laryngeus recurrens sin. zu verschiedenen Strukturen des Herzens (Vorhöfe, Lungenvenen, Hohlvenen, Herzvenen) untersucht.

Ergebnisse Die Untersuchungsergebnisse zeigen eindeutig die engen Lagebeziehungen der Nn. phrenici zu kardialen Strukturen. Eine Nahebeziehung des N. laryngeus recurrens sin. besteht allerdings nicht. *N. phrenicus dext.*: Der rechte N. phrenicus hat seinen engsten Kontakt mit der V. cava sup. und mit der V. pulmonalis dext. sup. *N. phrenicus sin.*: Der linke N. phrenicus hat mit dem linken Vorhof sowie dem Tributärgebiet des Sinus coronarius enge Beziehung. *N. laryngeus recurrens sin.*: Der linke N. laryngeus recurrens hat keinerlei Kontakt zu kardialen Strukturen. Er ist selbst bei weit dilatierendem linken Atrium immer noch durch die A. pulmonalis sin. vom Herzen getrennt.

Schlußfolgerung Bei Therapie von Sinustachykardien können Ablationen im Bereich der V. cava sup. durch Schädigung des N. phrenicus dext. zu Zwerchfell-Lähmungen führen. Ebenfalls kann eine segmentale ostiale Zirkumferenz-Ablation der Lungenvenen zu rechten Zwerchfell-Lähmungen führen. Der N. phrenicus sin. ist bei der Implantation von Schrittmacherelektroden in der V. obliqua atri sin. oder der V. cardiaca magna in Gefahr. Eine Beeinträchtigung des N. laryngeus recurrens sin., wie von Pai et al. (2005) beschrieben, kann nicht durch die Katheterablation selbst, wohl aber durch die vorangegangene transösophageale Echokardiographie erzeugt worden sein.

VII-6

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Schrittmachertherapie in Österreich: Werden Frauen benachteiligt?

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Einleitung Frauen wurden bisher in der Behandlung der koronaren Herzerkrankung benachteiligt. Es gibt wenige Daten, die belegen, ob dies auch für die Schrittmachertherapie zutrifft. In Österreich existiert seit 1980 ein zentrales Schrittmacherregister, in dem alle Implantationen dokumentiert werden. Wir analysierten geschlechtsspezifische Unterschiede in Bezug auf Indikation und Verwendung physiologischer Schrittmachersysteme (AAI, DDD, VDD), die den Vorhof in Stimulation und/oder Wahrnehmung einbeziehen.

Patienten und Methode Zwischen 1980 und 2005 wurden in Österreich 95.356 Schrittmacher (SM) erstimplantiert, davon in 48 % der Fälle bei Frauen. Das Durchschnittsalter betrug 76 ± 10 Lebensjahre (Frauen 77 a, Männer 75 a). Zu 56 % wurde der unphysiologische VVI-SM ($w = 48$ %), zu 41 % ein DDD/VDD-SM ($w = 46$ %) und zu 3 % ein AAI-SM ($w = 51$ %) eingebaut. Die Auswertung der Daten erfolgte zum einen hinsichtlich geschlechtsspe-

Tabelle 4: B. Fellner et al.

Zeitpunkt der Erstimplantation	1980–1995		1996–2005	
	Frauen	Männer	Frauen	Männer
Anteil in %	48	52	48	52
Stimulationsformen				
VVI (in %)	74*	69	58	55
AAI (in %)	4	4	3	3
DDD (in %)	22	27	39	42
PM-Indikation AV-Block	n = 20.264		n = 34.416	
Anteil in %	47	53	46	54
VVI (in %)	66*	59	49*	42
DDD/VDD (in %)	34*	41	51*	58
PM-Indikation SSS	n = 15.515		n = 27.490	
Anteil in %	53	47	54	46
VVI (in %)	69*	65	48*	45
AAI (in %)	7	6	6	5
DDD (in %)	24*	29	46*	50
*p < 0,01				

zifischer Unterschiede bei den zwei Hauptindikationen AV-Block und Sick-Sinus-Syndrom (SSS) und zum anderen wurden aufgrund der langen Nachbeobachtung und der technischen Entwicklung der SM zwei Zeiträume (1980–1995 und 1996–2005) verglichen.

Ergebnisse Frauen erhielten bei der Indikation SSS signifikant häufiger einen SM, Männer bei der Indikation AV-Block. Bei den weiblichen Patienten wurde sowohl bei SSS als auch bei AV-Block signifikant seltener ein physiologisches System (AAI, DDD, VDD) verwendet (Tabelle 4).

Zusammenfassung Obwohl in Österreich der Anteil physiologischer Schrittmachersysteme in den letzten Jahren deutlich gestiegen ist, werden bei Frauen weiterhin signifikant häufiger unphysiologische VVI-Schrittmacher eingebaut. Zum Zeitpunkt der Erstimplantation sind Frauen durchschnittlich zwar um zwei Jahre älter als Männer (75 a vs. 77 a), diese Tatsache rechtfertigt jedoch nicht, daß Frauen in der Auswahl eines physiologischen Schrittmachersystems benachteiligt werden.

VII-7

092

Analysis of TpTe-Interval for Prediction of Long-Term Prognosis in Cardiovascular Disease

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Objective From findings in experimental studies the interval from the peak to the end of the T wave (TpTe) has been proposed to reflect the heterogeneity of action potential durations within the ventricular wall. A prolonged TpTe interval has been suggested to indicate arrhythmic risk. Since heart failure as well as ischaemic heart disease is known to increase transmural repolarisation heterogeneity we hypothesised that TpTe could be used to assess long term prognosis in patients with cardiovascular disease.

Methods and Results Male US veterans (n = 813) with cardiovascular disease had digital 12-lead ECGs recorded between 1984 and 1991. Follow-up was prospectively assessed until 2000. Of 681 patients with technically analysable data, 224 died after a mean follow-up of 7.3 ± 3.6 years. The QT and QTpeak (QTp) intervals were obtained automatically by a previously verified extension of the QT Guard package (GE Medical). TpTe was computed as the difference between QT and QTP and averaged in leads V_4-V_6 . Both QT and TpTe were heart rate corrected using a population derived formula. Direct comparison between dead and alive patients showed that those who died had significantly shorter TpTe intervals than those surviving (78.99 ± 16.66 ms vs. 82.38 ± 16.7 ms; $p < 0.05$). This was independent of any difference in heart rate since the difference was even more pronounced after correcting TpTe for heart rate (98.76 ± 20.63 ms vs. 103.14 ± 20.87 ms).

Conclusion Against expectations TpTe intervals in patients who died during follow-up were significantly shorter than in survivors implying that in cardiovascular disease a long TpTe interval is associated with a better prognosis. This suggests that either transmural repolarisation heterogeneity in those who died indeed was smaller than in survivors or that TpTe interval derived trans-thoracically from a heart in situ truly reflects something else than this heterogeneity.

VII-8

046

Single-Beat Non-Invasive Imaging of Ventricular Preexcitation

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Background Aim of this study was to determine whether non-invasive imaging of cardiac electrophysiology (NICE) is feasible in patients with Wolff-Parkinson-White (WPW) syndrome in the clinical setting of a catheter laboratory and to test the accuracy of the non-invasive obtained ventricular activation sequences as compared to standard invasive electroanatomic mapping.

Methods NICE uses the fusion of data from high-resolution ECG mapping and an individual model of cardiac anatomy obtained from magnetic resonance imaging (MRI). The computation of the ventricular activation sequence uses a bidomain-theory based heart model to solve this inverse problem. NICE was performed in seven patients (3 female, mean age 29 ± 9 years) with WPW syndrome undergoing catheter ablation of the accessory pathway. The spatial and temporal accuracy of the computed activation maps were validated by the distance between the earliest computed activation by NICE and the successful ablation site identified by invasive electroanatomic mapping (CartoTM) for normal AV-conduction as well as during adenosine induced total AV-block.

Results The error introduced by geometrical coupling of the CartoTM data to NICE model was 5 ± 3 mm (model discretisation 10 mm). All ventricular accessory pathway insertion sites were identified with an accuracy of 18.7 ± 5.8 mm (baseline) and 18.7 ± 6.4 mm (adenosine).

Conclusion The individual obtained model of cardiac anatomy of each patient enables accurate non-invasive electrocardiographic imaging of ventricular preexcitation in patients with WPW syndrome. NICE may be used as a complementary non-invasive approach to localise the origin and help to identify and understand the underlying mechanisms of cardiac arrhythmias.

POSTERDISKUSSION B

Freitag, 9. Juni 2006, 17.30–18.30 Uhr

Sitzung VIII – Basic Science

VIII-1

016

Effects of Atorvastatin on iNOS and TNF-Expression in Neointimal and Medial Smooth Muscle Cells

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Background Inflammation is supposed to play a crucial role in the formation of neointimal hyperplasia after percutaneous coronary intervention. Neointimal hyperplasia is considered to arise by the proliferation and migration of a population of smooth muscle cells, which display an inflammatory phenotype and are referred to as neointimal smooth muscle cells (niSMC). Statins have anti-inflammatory effects including enhanced local production of nitric oxide (NO) and inhibited expression of cytokines such as tumor necrosis factor (TNF). It is unknown to which extent atorvastatin influences expression of inducible nitric oxide synthase (iNOS) and TNF in niSMC.

Methods and Results Medial SMC (mSMC) were isolated from the medial layer of the thoracic aorta of 6-week-old male Sprague-Dawley rats, and niSMC were derived from the intimal thickening of the thoracic aorta 2 weeks after balloon angioplasty. NiSMC showed increased basal expression of both TNF and iNOS mRNA expression, as assessed by RT-PCR. Incubation with atorvastatin (0,01 to 10 μ M) for 12 and 24 hours stimulated iNOS expression in both niSMC and mSMC. In contrast, incubation with atorvastatin (0,01 to 10 μ M) for 24 hours decreased TNF expression in medial SMC, but had no effect on the high TNF mRNA levels detected in niSMC.

Conclusion Atorvastatin enhances iNOS expression in both types of SMC, which may lead to increased local production of NO, thus promoting vasodilation and decreased platelet adhesiveness. However, the anti-inflammatory potential of atorvastatin in terms of diminishing TNF expression is limited to mSMC, whereas this compound is not capable to inhibit the increased TNF expression in niSMC.

VIII-2

085

Ischaemic Preconditioning Increases Plasma Levels of Vascular Endothelial Growth Factor, But Attenuates the Ischaemia-Induced Mobilisation of Bone Marrow Mesenchymal Stem CellsJ. Matiaszek, S. Farhan, N. Pavo, S. Steiner-Boker, C. Kopp, R. Garamvolgyi, Z. Petrasi, A. Hevesi, D. Glogar, J. Wojta, K. Huber, M. Gyöngyösi
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Background Myocardial ischaemia induces parallel increase in plasma level of vascular endothelial growth factor (VEGF), and mobilisation of bone marrow- (BM-) derived stem cells (SC) leading to homing of BM SCs in infarcted myocardium with consequent angiogenesis and myogenesis. The aim of this study was to investigate the effect of ischaemic preconditioning on plasma levels of VEGF and circulating haematopoietic and mesenchymal SCs in porcine coronary occlusion/reperfusion model.

Methods Thirty-five pigs underwent 90 min coronary occlusion followed by 60 min reperfusion. IP was obtained in 18 of 35 pigs by 2 cycles of 5 min of percutaneous balloon occlusion of the left anterior descending coronary artery with 2 cycles of 5 min interval of reperfusion before 90 min occlusions (group P), while constant coronary occlusion with reperfusion was performed in the remaining 17 pigs (group AMI). The size of area at risk and myocardial infarction was measured by computerised planimetry. Plasma levels of VEGF were determined by ELISA kits. BM haematopoietic and mesenchymal SCs were characterised by coexpression of CD45⁺, CD44⁺, CD90⁺ and CD31⁺, measured by whole blood flow cytometry from venous blood taken at baseline and at the end of the reperfusion.

Results IP resulted in a decrease of the myocardial infarction size (23.5 ± 4.6 vs. 17.1 ± 3.7 %, in Groups AMI and P; $p < 0.05$). After preconditioning, the plasma VEGF increased significantly (from 11.7 ± 8.4 to 18.2 ± 9.7 ng/ml; $p < 0.01$) with further increase during the occlusion and final reperfusion (23.5 ± 16 ng/ml; $p < 0.05$). In group AMI the plasma VEGF increase was less impressive (from 11.4 ± 8.3 to 14.3 ± 7.5 ng/ml; $p < 0.05$). Relative increase (ratio of post-final reperfusion and baseline values) of the BM-derived haematopoietic SC was measured in both groups (132 ± 96 % vs. 122 ± 51 % in groups AMI and P). Number of circulating mesenchymal SCs increased only in group AMI as compared with group P (115 ± 32 vs. 93 ± 24 %; $p < 0.05$).

Conclusions Acute myocardial ischaemia followed by reperfusion induces elevation of plasma VEGF concentration, and mobilisation of BM haematopoietic and mesenchymal SCs. Brief repetitive ischaemia before coronary occlusion increases the levels of circulating VEGF and decreases the infarct size but attenuates mobilisation of BM mesenchymal SCs.

VIII-3

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A Role for GP 130-ligands in Angiogenesis: Oncostatin M Regulates Angiopoietin-1, Angiopoietin-2 and its Own Receptors in Human Endothelial CellsK. Rychliř, C. Kaun¹, P. J. Hohensinner¹, T. W. Weiss¹, G. Maurer¹, K. Huber², J. Wojta¹¹Department of Internal Medicine II, Medical University of Vienna; ²3rd Med. Dept., Cardiology and Emergency Medicine, Wilhelminenhospital, Vienna

Objective The angiopoietin-Tie2 system acts as a crucial regulator of vessel maturation and quiescence. Angiopoietin-1 (Ang1), which activates the Tie2 receptor, stabilises vessel walls, suppresses angiogenesis, and has inflammatory properties. Angiopoietin-2 (Ang2), which binds to the same receptor, has been identified as a functional antagonist of Ang1 leading to vessel regression or sprouting depending on the presence of other angiogenic factors. There is evidence that the angiopoietin-Tie2 system is also involved in inflammatory angiogenesis. We asked if there might be a link between the glycoprotein (GP) 130 ligand system, which has been shown to regulate cell proliferation and inflammatory events in other tissues, and the angiopoietin-Tie2 system.

Methods Human umbilical vein endothelial cells (HUVECs) were treated with the GP 130 ligands oncostatin M (OSM), cardiotrophin-1 (CT-1), interleukin-6 (IL-6), leukemia inhibitory factor (LIF), IL-11 and ciliary neurotrophic factor (CNTF), respectively, for 48 hours. The protein expression was determined by a specific ELISA or by western blotting and RT-PCR was used to determine mRNA levels employing specific primers.

Results Oncostatin M (OSM) increased Ang2 secretion up to 3-fold and decreased Ang1 secretion down to 25 % of the control level in HUVEC dose-dependently. Ang1 secretion was also slightly down-regulated by LIF. These data could also be confirmed at mRNA levels at different stimulation times. We could detect all five GP 130 ligand-receptors in HUVEC and found a significant up-regulation of the OSM receptor, LIF receptor and GP 130 by its own ligand OSM. We could further show that this up-regulation leads to a detectable amplification of the effect of OSM.

Conclusion We showed for the first time a link between the GP 130 ligand system and angiogenesis in HUVECs. OSM, mainly produced by activated T-cells and monocytes, does not only regulate the secretion of Ang1 and its antagonist Ang2 in a reciprocal manner, but also increases the expression of its own receptors, thereby amplifying the stimulatory effect. Therefore OSM might be an important contributor to *de novo* formation of blood vessels.

VIII-4

066

Echocardiographic Phenotyping in a Transgenic Mouse Model

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Background With the advent of transgenic technology, genetically altered mice with remarkable cardiovascular phenotypes are available now. To benefit from the full potential of these genetically engineered mice, it is crucial to have approaches to an accurate and reproducible assessment of cardiac anatomy and performance. Cardiac ultrasound is a proved and well established technique for non-invasive evaluation of left ventricular (LV) morphology and function in different species. In this particular study, we used transthoracic echocardiography (TTE) for cardiac phenotyping in mice lacking adipose triglyceride lipase (ATGL). ATGL-deficient mice are supposed to die from lethal cardiomyopathy due to defective lipolysis.

Materials and Methods TTE was performed in non-anaesthetised mice (12 knock-out, 11 wild-type, age range 59–136 days) using an Acuson Sequoia 512 equipped with a 15 MHz linear transducer (15L8). The heart was first imaged in the two-dimensional (2D) mode in the parasternal long- and short-axis view. From short-axis view at the tip of the papillary muscle, motion-mode (M-mode) images were obtained for measurement of LV enddiastolic and end-systolic diameter as well as interventricular septum (IVS) and left ventricular posterior wall (LVPW) thickness during diastole and systole. From these M-mode dimensions, LV fractional shortening (FS), LV ejection fraction (EF), IVS and LVPW thickening, IVS/LVPW ratio, and LV myocardial mass (LVMM) were calculated.

Results 2D-echocardiography revealed marked concentric LV hypertrophy with an abnormal myocardial texture in ATGL-deficient animals. LV hypertrophy, abnormal myocardial texture, and impaired LV systolic function with asynchronous contraction patterns developed progressively with age. Additionally, in one older animal a large circumferential pericardial effusion could be clearly detected. M-mode tracings confirmed pronounced LV hypertrophy in ATGL-deficient mice as indicated by increased diastolic wall thickness and LVMM, while systolic wall thickness as well as chamber dimensions were not significantly different between the two groups. Systolic thickening of the IVS and LVPW was markedly reduced in ATGL-deficient mice, indicating a significantly reduced LV systolic function. This was also reflected by a significant reduction in LV FS and LV EF in ATGL-deficient mice compared to controls.

Conclusions Echocardiography provides a powerful tool for studying cardiac morphology and function in mice. In this particular mouse model, TTE clearly allowed to discriminate knock-out animals from controls and to follow the development of heart failure in ATGL-deficient mice.

VIII-5

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Statins Decrease TNF- α Induced Osteoprotegerin Production by Endothelial Cells in Vitro

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Introduction Osteoprotegerin (OPG) is a soluble receptor belonging to the tumor necrosis factor receptor superfamily and antagonises the effect of receptor activator of NF- κ B ligand (RANKL). Recently OPG was described as an independent risk factor in cardiovascular disease. Furthermore it was shown that increased levels of OPG are associated with severity of coronary artery disease and that OPG is a marker for vascular calcification. In vitro evidence showed that OPG directly is chemoattractive for mononuclear cells. Therefore the aim of the study was to determine if statins, a known anti-inflammatory mediator, influence the expression of OPG in endothelial cells.

Results and Discussion Statins only slightly decreased basal expression of OPG protein in human umbilical vein endothelial cells (HUVEC). We treated HUVEC with TNF- α , a strong inducer of OPG. Statins decreased TNF- α induced OPG protein expression significantly. These results were confirmed on the level of specific mRNA expression. Statin inhibition of HMG-CoA reductase activity directly blocks the production of mevalonate at the cholesterol syntheses pathway. Therefore mevalonate was added to atorvastatin and TNF- α treated cells. Mevalonate addition reversed the down-regulating effect of atorvastatin on TNF- α induced OPG secretion. Another important product of HMG-CoA reductase is geranylgeranylpyrophosphate (GGPP), which plays a role in post translational modification of several proteins including small G proteins such as Rho and Rac. The addition of GGPP to atorvastatin and TNF- α treated cells also reduced the down-regulating effect of atorvastatin on OPG secretion. In conclusion we have added OPG to the list of molecules whose TNF- α -induced upregulation is counteracted by statins. If such an effect is also operative in the in vivo setting, one could postulate a role for statins in the modulation of cardiovascular disease processes possibly regulated by OPG.

VIII-6

047

Histological Correlation of Sonographically Assessed Brachial Artery Wall Thickness with Histological Measurements

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Background We have previously shown that brachial artery intima media thickness (BAIMT) as assessed with high-resolution ultrasound predicts late cardiovascular events in patients undergoing coronary angiography. Whether sonographically assessed BAIMT reflects anatomical wall thickness of the brachial artery has not been studied.

Methods BAIMT was measured *post mortem* in 19 formalin-fixed human bodies using high resolution ultrasound (13 MHz) in zoom mode. Thereafter, the proximal and distal ends of the measured sites were marked with needles and the forearm at these sites was dissected. Ultrasound measurements were performed offline. Four measurements were performed at the far wall of the vessel for the intimal layer (echodense layer), medial layer (echolucent layer) as well as the whole IMT. The mean of all intimal, medial and whole IMT measurements was calculated for comparison with histological measurements. For histological analyses the brachial artery was carefully dissected, embedded and sections of 7 μ m were stained with haematoxylin eosin. The far wall – as measured with sonography – was marked for identification in histological analyses. The intima, media and IMT were measured histomorphometrically using light microscopy in 3 different sections and the mean was calculated.

Results A strong correlation was found between histologically and sonographically measured media ($r = 0.615$; $p = 0.009$) as well as whole IMT ($r = 0.506$; $p = 0.04$), whereas no correlation was found for the intimal layer. Results showed that intima ($192.1 \mu\text{m}$ vs. $83.3 \mu\text{m}$; $p < 0.001$) and whole IMT ($559.4 \mu\text{m}$ vs. $428.1 \mu\text{m}$; $p = 0.004$) were systematically overestimated by ultrasound compared with histology, whereas the medial layer ($387.6 \mu\text{m}$ vs. $354.2 \mu\text{m}$; $p = \text{n. s.}$) was accurately measured by ultrasound.

Conclusion Sonographically assessed BAIMT shows good correlation with histological measurements in humans, with similar values as previously obtained for carotid artery IMT measurement. This validation may further help to establish sonographically assessed BAIMT as a marker of atherosclerotic risk.

VIII-7

108

Regulation of OPG and RANK through Inflammation in Heart Cells in Vitro

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Objective The osteoprotegerin (OPG)/receptor activator of nuclear factor κB ligand (RANKL)/receptor activator of nuclear factor κB (RANK) system was identified to play a key role in bone metabolism and in particular as mediator of osteoclastogenesis. Further, it has been shown that OPG/RANKL/RANK interaction does not only take place in skeletal metabolism, but can also be found in processes of the immune and vascular system. These findings suggest a complex link in mediation of bone, vascular and immune physiology via the OPG/RANKL/RANK system. OPG binds with high affinity to RANKL, thereby inhibiting the interaction between RANKL and its receptor RANK. Our focus of interest was to study a possible role of the OPG/RANKL/RANK system in inflammatory processes in the heart.

Results While a significant increase of OPG in human adult cardiac fibroblasts (HACF) after stimulation with $\text{TNF-}\alpha$ was observed, no response was found in human adult cardiac myocytes (HACM) after the same treatment. Three-fold higher OPG-mRNA levels were detected in HACF after stimulation with $\text{TNF-}\alpha$ compared to untreated HACF. Based on a specific ELISA significantly higher levels of OPG in HACF were detected after 12, 24, 36 and 48 hours of stimulation with $\text{TNF-}\alpha$. Furthermore, an up-regulation was found in the expression of RANK in HACF after incubation with $\text{TNF-}\alpha$ on the level of specific mRNA expression. The presence of RANK on HACF was confirmed through western blot.

Conclusion Our results show that HACF express OPG and RANK and that their expression is up-regulated by inflammatory activation. In contrast OPG and RANK expression was not affected in HACM. If also operative in vivo our data imply that under inflammatory conditions cardiac fibroblasts but not cardiac myocytes are actively involved in the production and secretion of RANK and OPG, with the latter being reported to be elevated in patients with heart failure.

Sitzung IX – Chirurgie

IX-1

083

Langzeithaltbarkeit und Notwendigkeit von Reinterventionen nach Stentgraftinsertionen bei thorakalen Aortenaneurysmen

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Hintergrund Ziel dieser klinischen Untersuchung war es, Langzeithaltbarkeit und Notwendigkeit von Reinterventionen nach

Stentgraftinsertionen bei thorakalen Aortenaneurysmen zu untersuchen.

Methodik In der Zeit von Oktober 1996 bis Juli 2005 haben wir 70 Patienten mit thorakalen Aortenaneurysmen endovaskulär behandelt. Der mediane Nachbeobachtungszeitraum betrug 34 Monate (1–92 Monate). Spitalsmortalität, Auftreten von frühen und späten Endoleaks, deren Behandlungsnotwendigkeit sowie das Langzeitüberleben wurden untersucht.

Ergebnisse Die Spitalsmortalität betrug 5,7 % ($n = 4$), zwei dieser Patienten wurden akut behandelt. Die primäre technische Erfolgsrate betrug 97,2 %. Frühe Typ-I- und -III-Endoleaks traten bei 28 % ($n = 19$) auf, davon wurden 7 Patienten endovaskulär behandelt, bei 4 Patienten hat sich das Endoleak spontan verschlossen. Frühe Typ-I- und -III-Endoleaks waren häufiger, wenn das Aneurysma nicht nur die Aorta descendens, sondern auch den Bogen involviert hat (41 % vs. 16 %; $p = 0,04$). Späte Typ-I- und -III-Endoleaks traten in 7,4 % ($n = 5$) auf. Endotension wurde in 2,8 % ($n = 2$) beobachtet, beide Fälle konnten erfolgreich endovaskulär saniert werden. Das Überleben nach 1, 3 und 5 Jahren betrug 88,6 %, 75,6 % sowie 65,7 %.

Schlußfolgerungen Die Langzeithaltbarkeit nach Stentgraftinsertionen bei thorakalen Aortenaneurysmen ist zufriedenstellend. Trotz einer beträchtlichen Anzahl an Endoleaks ist die Rate früher und später Endoleaks, die behandelt werden müssen, gering. Weitere klinische Untersuchungen sind notwendig, um die Langzeithaltbarkeit dieser neuen Behandlungsmethode zu evaluieren.

IX-2

084

Erste weltweit erfolgreiche endovaskuläre Behandlung einer akuten Typ-A-Dissektion

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Hintergrund Die Behandlung akuter Typ-A-Dissektionen war bis dato eine Domäne der konventionellen chirurgischen Versorgung mit einer substantiellen Begleitmorbidität und -mortalität.

Methodik Im Juli 2005 wurde ein 84-jähriger Patient mit einer akuten Typ-A-Dissektion, die bereits neurologische Ausfälle verursacht hat, an unsere Abteilung überwiesen. Aufgrund des Alters, der Neurologie und der Begleitmorbiditäten kam eine interventionelle Behandlung nicht in Frage. Deswegen haben wir eine endovaskuläre Stentgraftinsertion durchgeführt.

Ergebnisse Diese weltweit erste endovaskuläre Stentgraftinsertion bei einer akuten Typ-A-Dissektion ist erfolgreich verlaufen. Das primäre Entry, das an der Konkavität der Aorta ascendens gelegen ist, konnte vollständig verschlossen werden. Die Neurologie hat sich vollständig zurückgebildet, der Patient konnte das Spital nach 10 Tagen verlassen. Sechs Monate nach dem Eingriff ist das Kontroll-CT einwandfrei und der Patient in einem guten klinischen Zustand.

Schlußfolgerungen Die Behandlung akuter Typ-A-Dissektionen durch endovaskuläre Stentgraftinsertion ist erfolgreich durchführbar. Dieser Durchbruch wird einer selektiven Subgruppe von Patienten, die für eine konventionelle Sanierung zu alt oder zu krank sind, eine sinnvolle Behandlungsoption einräumen.

IX-3

064

Die MAZE-Operation zur Behandlung des permanenten Vorhofflimmerns: batriales versus linksatriales endokardiales Linienkonzept

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Grundlagen Die batriale MAZE-Operation mit Mikrowellen- oder Radiofrequenzablation ist ein etabliertes Verfahren zur Be-

handlung des permanenten Vorhofflimmerns. Diese retrospektive Studie vergleicht die Ergebnisse zwischen biatrialer und linksatrialer endokardialer Ablation.

Methodik Zwischen 2/2001 und 3/2005 wurden 56 Patienten mit chronischem Vorhofflimmern > 6 Monate ($66,5 \pm 7,2$ Jahre, 14 Männer) und zusätzlicher teils kombinierter Klappenerkrankung mittels Mitralklappenersatz/-rekonstruktion $\pm$ Trikuspidalklappenrekonstruktion ($n = 40$), Aortenklappenersatz $\pm$ Trikuspidalklappenrekonstruktion ($n = 6$) und Mitralklappen- $\pm$ Aortenklappenersatz/-rekonstruktion $\pm$ Trikuspidalklappenrekonstruktion ($n = 7$), ACBP + Mitralklappenrekonstruktion ($n = 3$) und MAZE operiert. Bei der MAZE-Operation wurden, dem Cox-III-Konzept folgend, in beiden Vorhöfen (Gruppe 1, $n = 42$) bzw. linksatrial (Gruppe 2, $n = 14$) endokardiale lineare Läsionen mit Mikrowellen- bzw. Radiofrequenzablation gesetzt. Die mittlere Dauer des Vorhofflimmerns lag bei 63 ± 29 Monaten und 50 ± 71 Monaten in Gruppe 1 und 2.

Ergebnisse Die MAZE-Operation führte zu 23 ± 4 Minuten zusätzlicher Aortenklammzeit ohne Unterschied zwischen den beiden Gruppen. Aufgrund eines SIRS war bei einem Patienten in der Gruppe 1 der Intensivaufenthalt verlängert. Bei den restlichen Patienten war die Intubationsdauer $18,3 \pm 6,7$ vs. $13,4 \pm 3,9$ Stunden, der Intensivaufenthalt $1,7 \pm 0,6$ vs. $1,5 \pm 1,2$ Tage. 54 % vs. 57 % wurden mit Sedacoron behandelt, 64 % vs. 21 % kardiovertiert. Zum letzten Nachuntersuchungszeitpunkt (36 ± 8 Monate bzw. 13 ± 5 Monate; Gruppe 1 bzw. 2) waren 78 % bzw. 71 % frei von Vorhofflimmern: 60 % vs. 64 % SR, 4 % vs. 7 % Knotenrhythmus, 16 % vs. 7 % PM, 20 % vs. 21 % Vorhofflimmern bzw. -flattern.

Schlussfolgerungen Die MAZE-Operation mittels Mikrowellen- bzw. Radiofrequenzablation, folgend dem Cox-III-MAZE-Konzept, erhöht das chirurgische Risiko nur gering. Das rein linksatriale, endokardiale Linienkonzept scheint dem biatrialen Vorgehen ebenbürtig zu sein. Die Freiheit von Vorhofflimmern ist praktisch gleich. Die Inzidenz an notwendiger PM-Implantation war in der rein linksatrial ablierten Gruppe deutlich geringer.

IX-4

099

Gender Differences in Severe Aortic Stenosis Referred to Aortic Valve Surgery

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Background Aortic stenosis has become the most frequent valve disease in developed countries and has been extensively studied in recent years. Although gender differences have drawn increasing attention in cardiology, little is known so far about gender differences in aortic stenosis.

Methods The clinical and echocardiographic characteristics of 439 consecutive patients (age 70 ± 11 yrs) who were seen in our outpatient clinic and referred to surgery because of severe symptomatic aortic stenosis were analysed with regard to potential gender differences.

Results Patients were almost equally distributed between men ($n = 205$) and women ($n = 234$). Female pts were, however, significantly older at presentation with a mean age of 73 ± 10 yrs compared to 66 ± 11 yrs ($p < 0.0001$). They were more symptomatic than males with a New York Heart Association class 2.5 ± 0.7 vs. 2.1 ± 0.7 , respectively ($p < 0.0001$). Females had smaller valve areas. However, when adjusting for body surface area (BSA), this difference disappeared (0.33 ± 0.1 vs. 0.34 ± 0.08 cm²/m²; $p = 0.21$). Nevertheless, mean aortic valve gradients were significantly higher in females with 66.6 ± 19.1 vs. 62.1 ± 20.2 mmHg ($p = 0.017$). LV size did not differ when adjusting for BSA but females presented with significantly less LV hypertrophy. Notably, 74 % of women presented with hypertension compared to 58 % of men ($p < 0.0005$). However, coronary artery disease was significantly more frequent in male patients (39 % vs. 27 %; $p = 0.01$).

Conclusion Female patients with aortic stenosis referred to aortic valve replacement are older and more symptomatic compared to

male patients. Further research must address whether this is due to differences in disease onset and progression or whether female patients get delayed medical attention for some reasons.

IX-5

036

Does Intraoperative Coronary Angiography Affect Renal Function in Patients Undergoing Innovative Coronary Bypass Revascularisation?

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Purpose Intraoperative graft angiography is considered to be the goldstandard quality control in innovative coronary bypass techniques. Iodixanol, an iso-osmolar, non-ionic contrast agent, has been shown to be safe in patients with impaired renal function. We sought to evaluate postoperative nephropathy in coronary bypass patients undergoing intraoperative angiography and to identify potential association of risk factors.

Methods A total of 135 patients, mean age 60 years, underwent intraoperative bypass angiography during innovative revascularisation procedures. Robotically assisted CABG via sternotomy ($n = 36$), off pump coronary bypass grafting (OPCAB, $n = 41$), arrested heart total endoscopic grafting (AHTECAB, $n = 51$) and beating heart total endoscopic grafting (BHTECAB, $n = 7$) were performed. In all patients iodixanol (Visipaque 32, GE Healthcare Bio-Sciences) was used for angiography, median amount was 150 (20–500 ml). Nephropathy was defined as an increase in serum creatinine concentration of ≥ 0.5 mg/dl in comparison to preoperative values.

Results In 19/135 (14 %) of the patients nephropathy occurred and was correlated with 5 variables:

- preoperative serum creatinine ($p = 0.015$, $r = 0.208$)
- age ($p = 0.008$, $r = 0.229$)
- postoperative peak troponin T levels ($p < 0.001$, $r = 0.545$)
- postoperative peak levels of CK-MB ($p = 0.028$, $r = 0.189$)
- presence of peripheral vascular disease ($p = 0.011$).

There was no correlation for the amount of contrast agent applied, diabetes mellitus, hypertension, preoperative urea, cardiopulmonary bypass time, aortic cross clamp time or postoperative peak levels of creatinase.

Conclusion Our study only identifies older age and preoperative elevated serum creatinine levels as major risk factors for postoperative nephropathy in patients undergoing innovative coronary artery bypass grafting monitored by intraoperative angiography. We could not identify any correlation to the perioperative angiographic diagnostic approach.

IX-6

114

Einfluß einer perioperativen antithrombotischen Begleitmedikation auf das Auftreten von Blutungskomplikationen bei elektiven Schrittmacherimplantationen

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Hintergrund Die Schrittmacherimplantation hat entsprechend den Daten in der Literatur eine Blutungsrate von 0,5–0,7 %. Ein präoperatives Absetzen von Acetylsalicylsäure (ASS), Clopidogrel (Clop) und oraler Antikoagulation (OAK) ist zur klinischen Routine geworden. In einer retrospektiven Analyse haben wir die Daten von 191 Patienten (Pat.), bei denen 2005 eine permanente Schrittmacher- (PM-) Implantation oder ein Generatortausch durchgeführt wurde, im Hinblick auf die perioperative antithrombotische Therapie, Blutungskomplikationen und die Verwendung eines speziellen Fibrinklebers (FK) untersucht.

Methode Im Jahr 2005 wurden an unserer Abteilung 191 Schrittmacher implantiert (143 Erstimplantationen und 49 Generatortausche). Das durchschnittliche Alter bei Implantation betrug 77 Jahre, 52 % waren männlich. Es wurden 96 Einkammer- und 95 Zweikammergeräte implantiert. Als Indikation bestand bei 81 Pat. ein höhergradiger AV-Block, bei 50 Pat. ein SSS, bei 50 Pat. ein Brady-/Tachy-Syndrom und bei 10 Pat. ein bifaszikulärer Block.

Die perioperative antithrombotische Medikation, Verwendung des FK und die Inzidenz von schweren Blutungen (Hb-Abfall über 5 g/dl) sind in **Tabelle 5** angeführt.

Tabelle 5: J. Cup et al.

	Fibrinkleber	Blutung
ASS und Clop n = 6	n = 0	0
ASS oder Clop n = 25	n = 6	0
OAK INR > 1,5 n = 2	n = 2	0
OAK INR < 1,5 n = 37	n = 5	0
Keine Therapie n = 121	n = 5	0

Resultate

1. Bei 33 Pat. (17 %) wurde die PM-Operation unter einer gerinnungshemmenden Therapie durchgeführt.
2. Ein spezieller Fibrinkleber wurde bei 18 Pat. (8 %) nach Entscheidung des Interventionisten aufgrund des Lokalbefundes intraoperativ verwendet.
3. Bis auf minimale Hämatome, die den Spitalsaufenthalt jedoch nicht verlängerten, traten keine Blutungskomplikationen auf.

Konklusion PM-Implantationen oder Generatortausche können auch unter einer antithrombotischen Therapie ohne vermehrtes Blutungsrisiko durchgeführt werden. Eine exakte Blutstillung und in Einzelfällen die zusätzliche Verwendung eines Fibrinklebers sind dabei von Bedeutung.

Sitzung X – Diverse 3

X-1

027

Prospective Evaluation of International Diabetes Federation 2005 and Adult Treatment Panel III 2001 Criteria of the Metabolic Syndrome Among Women Undergoing Coronary Angiography

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Background The International Diabetes Federation (IDF) has recently established a worldwide consensus definition of the metabolic syndrome (MetS). The purpose of this study was to prospectively evaluate the cardiovascular risk associated with the IDF and Adult Treatment Panel III (ATP III) MetS definitions in women undergoing coronary angiography.

Methods In a prospective study on 241 women undergoing coronary angiography for the evaluation of coronary artery disease we recorded vascular events over 4 years.

Results From the women enrolled in our study, 34.9 % (n = 84) had the MetS according to the ATP III definition and 47.8 % (n = 115) according to the IDF definition. Concordance between the definitions was moderate (Cohen-Kappa coefficient = 0.537; p < 0.001). The MetS as defined by the ATP III criteria significantly predicted vascular events (adjusted hazard ratio = 2.133 [1.111–4.094]; p = 0.023) but the MetS as defined by IDF criteria did not (adjusted hazard ratio = 1.214 [0.635–2.319]; p = 0.558). Accordingly, event-free survival was significantly lower among women who fulfilled the ATP III but not the IDF criteria than among those who met the IDF but not the ATP III criteria (p = 0.035).

Conclusions Among women undergoing coronary angiography for the evaluation of CAD, the ATP III and the IDF definitions of the MetS do not identify the same patient populations. The ATP III definition of the MetS confers a significantly higher risk of vascular events than the IDF definition.

X-2

025

Type 2 Diabetes and the Coronary Angiographic State Are Mutually Independent Predictors of Future Vascular Events

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Background Type 2 diabetes (T2DM) in cross-sectional studies is associated with coronary artery disease (CAD) and prospectively confers a strongly increased risk of vascular events. It is uncertain to which extent the baseline CAD state accounts for the increased vascular risk of diabetic patients in prospective studies because angiography usually is not performed.

Methods We therefore enrolled 750 consecutive patients undergoing coronary angiography for the evaluation of CAD. At angiography, CAD was diagnosed in the presence of any irregularities of the vessel wall. Stenoses ≥ 50 % were considered significant, and the extent of CAD was defined as the number of significant stenoses in a patient. Vascular events were recorded over 4 years.

Results The prevalence of CAD (87.8 % vs. 80.4 %; p = 0.029) and of significant stenoses (69.5 % vs. 58.4 %; p = 0.010) as well as the extent of CAD (1.7 ± 1.5 vs. 1.4 ± 1.5 ; p = 0.014) were significantly higher in patients with T2DM (n = 164) than in nondiabetic subjects (n = 586). Prospectively, T2DM after multivariate adjustment strongly predicted vascular events (adjusted hazard ratio [HR] = 1.66 [1.15–2.39]; p = 0.006). Also, the presence of CAD (HR = 2.78 [1.39–5.57]; p = 0.004), the presence of significant stenoses (HR = 3.67 [2.30–5.85]; p < 0.001) and the extent of CAD (standardised adjusted HR = 1.62 [1.41–1.87]; p < 0.001) significantly predicted vascular events. These angiographic characteristics still predicted vascular events after additional adjustment for T2DM (HR = 2.66 [1.33–5.34]; p = 0.006, 3.57 [2.24–5.70]; p < 0.001, and 1.60 [1.34–1.84]; p < 0.001, respectively). Conversely, T2DM remained strongly and significantly predictive of future vascular events after adjustment for the presence and extent of CAD (HR = 1.50 [1.04–2.15]; p = 0.029).

Conclusions Among angiographed coronary patients, the presence and the extent of CAD are higher in patients with T2DM than in nondiabetic individuals. Prospectively, T2DM and the baseline CAD state are mutually independent predictors of future vascular events.

X-3

079

Konsequente Sekundärprävention verbessert koronare Endothelfunktion bei Patienten mit Diabetes mellitus Typ 2 und koronarer Herzkrankheit

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Hintergrund Bei Patienten mit koronarer Herzkrankheit (KHK) führt eine 4wöchige multifaktorielle Intervention zur Verbesserung der koronaren Endothelfunktion. In dieser Studie wurde deren Einfluß bei Patienten mit Diabetes mellitus Typ 2 (DM) und KHK nach 4 Wochen und 6 Monaten auf die Endothelfunktion untersucht.

Methode 23 Patienten mit DM + KHK wurden randomisiert in (a) eine Interventionsgruppe (I, n = 11): 4 Wochen stationäres Ergometertraining (6 × 15 min/d, 5 d/Woche), optimierte medikamentöse Therapie, fettarme Diät und anschließend 5 Monate Ergometertraining zu Hause (30 min/d) sowie 1x/Woche Gruppentraining; (b) Kontrollgruppe (K; n = 12): Betreuung durch den Hausarzt. Nach intrakoronarer Gabe von Acetylcholin, Adenosin und Nitroglycerin wurden Veränderungen des Koronardiameters mittels quantitativer Koronarangiographie und die mittlere Flußgeschwindigkeit mittels intrakoronarem Doppler bestimmt.

Ergebnis Zu Studienbeginn bestand zwischen den Gruppen kein signifikanter Unterschied bzgl. Körpergewichtsindex (I: 33.0 ± 4.8 vs. K: 27.8 ± 5.0), Triglyzeride (I: 3.5 ± 2.0 vs. K: 1.6 ± 0.9 mmol/L),

Cholesterin (I: $4,9 \pm 1,1$ vs. K: $4,9 \pm 1,1$ mmol/l), HbA1c (I: $6,6 \pm 1,4$ %; K: $7,5 \pm 0,9$ %), HDL (I: $1,3 \pm 0,4$ vs. K: $1,4 \pm 0,7$ mmol/l), LDL (I: $2,4 \pm 0,1$ vs. K: $2,8 \pm 1,1$ mmol/l) und körperlicher Leistungsfähigkeit (I: 131 ± 32 vs. K: 122 ± 36 Watt). Nach 4 Wochen und auch nach 6 Monaten zeigte sich in I eine signifikante Verbesserung bei diesen Parametern (alle mindestens $p < 0,05$), ohne signifikante Veränderungen in K. Nach 6 Monaten, nicht aber nach 4 Wochen, zeigten sich in I signifikante, durch Acetylcholin und Adenosin induzierte Veränderungen der koronaren Gefäßdurchmesser und Flußgeschwindigkeiten (alle $p < 0,05$), während diese Werte bei K unverändert blieben (alle $p = n. s.$).

Zusammenfassung Durch eine intensive Sekundärprävention kam es zu einer signifikanten Verbesserung des kardialen Risikoprofils nach 4 Wochen und nach 6 Monaten. Eine Verbesserung der koronaren Endothelfunktion zeigte sich erst nach 6 Monaten. Diese im Vergleich zu normoglykämischen Patienten verzögerte Verbesserung der Endothelfunktion könnte durch die in der Koronarangiographie nachgewiesene generalisiertere Gefäßschädigung bei Diabetikern sowie deren schnellere Progression erklärt werden, welche mit einer schlechteren Prognose assoziiert ist.

X-4

063

Das ACT-Projekt – LDL-Zielwerte von 6014 KHK-Patienten

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Ziel des ACT-Projektes (Austrian Cholesterol Screening and Treatment Programme regarding Achievement of Cholesterol Targets) ist es, den gegenwärtigen Stand der Lipidparameter von Patienten mit manifester KHK zu erfassen und entsprechende therapeutische Maßnahmen zu ergreifen, die in Guidelines definierten Zielwerte zu erreichen.

Österreichweit wurden von einem wissenschaftlichen Board Allgemeinmediziner und Internisten in der Praxis aufgefordert, KHK-Patienten unter laufender Statintherapie hinsichtlich ihrer Lipidwerte zu evaluieren. 6014 Patienten wurden in einer Erstanalyse ausgewertet. Das mittlere Alter lag bei 66,6 Jahren, 59,6 % waren Männer, Blutdruck $139,8/81,9$ mmHg, Herzfrequenz $72,4$ Schläge/Min., Bauchumfang $98,9$ cm. Einen LDL-Wert von unter 100 mg/dl erreichten lediglich 30,8 % aller Patienten (Männer 33 %, Frauen 27 %). LDL-Werte unter 113 mg/dl erzielten 43,5 % aller Patienten (Männer 47 %, Frauen 38 %). Die Werte bei weiblichen KHK-Patienten waren auch in allen Subgruppen signifikant höher, die Zahl der interventionellen Eingriffe und Bypassoperationen hoch signifikant niedriger.

Somit ergibt sich aus diesen Daten ein dringender Nachholbedarf für die Erreichung der LDL-Zielwerte in Österreich mit besonderem Fokus auf die Frau mit KHK.

X-5

078

Einfluß einer multifaktoriellen Intervention auf anti-diabetische Marker in Serum und Skelettmuskulatur von Patienten mit Diabetes mellitus Typ 2 und koronarer Herzkrankheit

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Hintergrund Ziel dieser Studie war es, den Einfluß einer intensiven, multifaktoriellen Sekundärprävention, die ein tägliches Ausdauertraining beinhaltete, sowohl auf die diabetische Stoffwechselslage im Serum als auch auf Veränderung auf mRNA-Ebene in der Skelettmuskulatur zu untersuchen.

Methodik 23 Patienten mit Diabetes mellitus Typ 2 und koronarer Herzkrankheit wurden in 2 Gruppen randomisiert: Interventionsgruppe (I): $6 \times$ täglich je 15 min Ergometertraining, Diätschulung,

angepaßte Diabetikerkost, optimierte medikamentöse Therapie; Kontrollgruppe (K): Behandlung nach geltenden Empfehlungen, Betreuung durch Hausarzt. Der Einfluß der Intervention wurde nach 4wöchiger Dauer kontrolliert und mit den Ergebnissen der Kontrollgruppe verglichen.

Ergebnis Nach 4 Wochen fand sich in der Interventionsgruppe eine signifikante Abnahme des Körpergewichts um 5,3 % (I: $-6,0 \pm 1,1$ vs. K: $+1,3 \pm 0,1$ kg; $p < 0,001$) und eine Zunahme der körperlichen Belastbarkeit um 25,3 % (I: 36 ± 8 vs. K: 4 ± 1 Watt; $p = 0,0004$). Im Serum zeigte sich eine signifikante Senkung des Gesamtcholesterins, des LDL-Cholesterins, des Nüchtern-Blutzuckers und des Resistins (Werte am Studienende: I: $3,5 \pm 0,6$ vs. K: $4,6 \pm 1,1$ mmol/l; $p = 0,017$; I: $1,8 \pm 0,5$ vs. K: $2,9 \pm 0,9$ mmol/l; $p = 0,008$; I: $6,2 \pm 1,6$ vs. K: $9,6 \pm 3,3$ mmol/l; $p = 0,018$; I: 8261 ± 4124 vs. K: 11.001 ± 4297 ; $p = 0,0186$; keine signifikanten Unterschiede bei den Ausgangswerten). Bei Adiponektin fanden sich keine signifikanten Veränderungen. In der Skelettmuskulatur konnte eine Zunahme der mRNA des PPAR γ von $3,5 \pm 1,1$ auf $7,1 \pm 3,7$ ($p = 0,0057$) gemessen werden, während die Kontrollgruppe keine signifikante Veränderung zeigte.

Schlußfolgerung Eine vierwöchige Intervention bestehend aus intensivem körperlichem Training, intensiver Diätschulung und optimierter Medikation führt zu einer effektiven Verbesserung des kardialen Risikoprofils und der diabetischen Stoffwechselslage auf zellulärer und molekularer Ebene in Serum und Skelettmuskel.

X-6

013

Vacation at Moderate Altitude Does Not Impair Cardiac Function in Patients with Metabolic Syndrome

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Background The influence of moderate altitude on cardiac function in patients with metabolic syndrome has not been sufficiently investigated so far. We studied the influence of a 3-week hiking vacation at moderate altitude (1700 m a. s. l.) on cardiac pump and endocrine function in individuals with metabolic syndrome.

Methods 18 male volunteers (age: 36–60, mean 55 years) with metabolic syndrome (according to the NCEP- or WHO-definition) participated in the study. The 3-week vacation program was not designed as a training programme and included 12 moderate-intensity guided hiking tours (4 times per week, at 55–65 % of maximal heart rate) with a total exercise time of 29 hours plus moderate recreational activities. Echocardiography and blood sampling were performed at 4 visits: T1 baseline in Innsbruck (576 m a. s. l.), T2 on the first day at moderate altitude (Obertauern, 1700 m a. s. l., Austria), T3 after 3 weeks at moderate altitude, T4 follow-up in Innsbruck (1 week later). B-type natriuretic peptide (BNP), NT-proBNP, and endothelin-1 were measured by commercially available assays (Shionogi, Roche Diagnostics, and Amersham, respectively). A symptom limited bicycle exercise stress test was performed at T1 and T4.

Results We found no significant changes in echocardiographic measures of systolic or diastolic function (ejection fraction, TEI index, E/A ratio, E wave deceleration time), estimated systolic pulmonary artery pressure, BNP and NT-proBNP, or endothelin-1 concentrations. There were no significant changes in the exercise capacities of the participants. However, the blood pressure at rest significantly decreased from T1 to T4.

Conclusion The 3-week vacation intervention at moderate altitude had no negative influence on cardiac pump or endocrine function or the pulmonary artery pressure, and we observed a significant reduction in blood pressure. Thus a guided and individually adapted hiking vacation appears to be safe and can be recommended for people with stable, controlled metabolic and cardiovascular risk factors.

X-7

009

The Comparison of Prevalence of the Metabolic Syndrome According to the Definition of NCEP ATP III or IDF

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Objective The aim of the present study was to compare the prevalence of the metabolic syndrome (MS) fulfilling the criteria of the National Cholesterol Education Program, Adult Treatment Panel III (NCEP ATP III) versus the International Diabetes Federation (IDF 2005) at a general-internal outpatient department and to evaluate the diagnostic implications.

Methods We enrolled 66 consecutive patients coming to our department for various reasons and assessed the following parameters: age and gender, waist circumference (WC), blood pressure, fasting glucose, HDL cholesterol, triglycerides and corresponding treatments. The following definitions were used: NCEP ATP III: waist circumference: male > 102 cm, female > 88 cm; blood pressure: $\geq 130/\geq 85$ mmHg; triglycerides: ≥ 150 mg/dl; HDL cholesterol < 40 mg/dl in male, < 50 mg/dl in female; fasting glucose: ≥ 110 mg/dl; MS is defined by 3 out of 5 risk factors. IDF 2005: waist circumference: male ≥ 94 cm, female ≥ 80 cm; blood pressure: $\geq 130/\geq 85$ mmHg (or therapy); triglycerides: ≥ 150 mg/dl (or therapy); HDL cholesterol < 40 mg/dl in male, < 50 mg/dl in female (or therapy); fasting glucose: ≥ 100 mg/dl (or therapy); MS is defined by increased waist circumference plus 2 out of 4

Results 56.1 % (n = 37) of the patients had a MS according to the ATP III criteria compared to 69.7 % (n = 46) according to IDF 2005. 36 patients (54.5 %) fulfilled both criteria. Hypertension was the most frequent risk factor present in 89.4 % (n = 59) of the subjects. 43.9 % (n = 29) had high triglycerides and 32 patients (48.5 %) had reduced HDL cholesterol levels. We found a positive correlation between increased waist circumference and the number of other risk factors which was more significant in ATP III ($r = 0.632$) than in IDF 2005 ($r = 0.424$). In addition WC was the most relevant risk factor for diagnosis of MS in both criteria. The prevalence of increased WC and increased fasting glucose was higher according to the IDF criteria than to ATP III. 86.4 % (n = 57) and 65.2 % (n = 43), respectively, had an increased waist circumference, 50.0 % vs. 37.9 % had increased fasting glucose levels.

Conclusions The prevalence of metabolic syndrome in a general internal outpatient department is high. It is obviously different depending on the criteria used. Independent of the definition measurement of waist circumference is an easy and practical tool to assess the risk of metabolic syndrome.

X-8

024

High Triglycerides, Low HDL-Cholesterol, and Small LDL-Particles Are the Main Lipid Risk Factors in Coronary Patients with Type 2 Diabetes

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Background Data on the impact of serum lipids on the incidence of vascular events in coronary patients with type 2 diabetes mellitus (T2DM) are scarce. The aim of this study was to identify the lipid risk factors which most strongly predict vascular events in these patients.

Methods We measured lipids and lipoproteins in fasting serum samples from 750 consecutive patients undergoing coronary angiography for the evaluation of coronary artery disease. Prospectively, we recorded vascular events over 4 years.

Results From our patients, 272 had normal fasting glucose < 100 mg/dl, 314 had impaired fasting glucose ≥ 100 mg/dl, and 164 had T2DM. The incidence of vascular events significantly ($p < 0.001$) increased from the group of patients with normal fasting glucose (14.7 %) over the group of patients with impaired fasting glucose (19.4 %) to the group of patients with T2DM (30.5 %). In patients with T2DM, triglycerides (standardised adjusted hazard ratio = 1.192 [95 %-CI 1.035–1.373]; $p = 0.015$), and, inversely,

HDL-cholesterol (standardised adjusted hazard ratio = 0.657 [0.456–0.948]; $p = 0.025$) and the LDL-particle diameter (standardised adjusted hazard ratio = 0.747 [0.568–0.983]; $p = 0.037$), but not total cholesterol ($p = 0.266$), LDL-cholesterol ($p = 0.999$), and apolipoprotein B ($p = 0.296$) were significantly predictive for the incidence of vascular events.

Conclusions High triglycerides, low HDL-cholesterol, and small LDL-particles are the main lipid risk factors for the incidence of vascular events among coronary patients with T2DM.

Sitzung XI – Diverse 4

XI-1

032

Difference in In-Stent Restenosis Rate Between Bare Metal Stents and Drug-Eluting Stents After Primary Coronary Intervention and Transcatheter Transplantation of Autologous Stem Cells for Acute Myocardial Infarction – a Quantitative Coronary Angiography Study

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Background Recent publications have shown that after acute myocardial infarction (MI) transplantation of autologous stem cells (ASC) into the necrotic area can improve cardiac function. However, an increased in-stent restenosis (ISR) rate has been reported following transcatheter ASC-transplantation. We sought to evaluate differences in the development of ISR between bare-metal stents (BMS) and drug-eluting stents (DES) following primary percutaneous coronary intervention (PCI) with subsequent transcatheter ASC-transplantation for acute MI.

Methods Patients (P) with acute anterior MI and primary PCI of the left anterior descendant branch (LAD) of the left coronary artery were randomly assigned to receive a BMS („group-BMS“, G-BMS) or DES („group-DES“, G-DES). The second day after MI stimulation of the bone marrow with granulocyte-colony stimulating factor (G-CSF) was initiated. Having achieved a peak of CD34-positive mononuclear cells in the peripheral blood, apheresis of ASC were performed. The ASC-suspension was injected into the LAD with the use of a balloon catheter, which was inflated with moderate pressure (4 atmospheres) within the stent of the former primary PCI. At baseline and after 6 months, quantitative coronary angiography (QCA) and left ventriculography were performed.

Results We included 8 P in G-BMS and 7 P in G-DES. No significant differences in age, comorbidities, risk factors, duration of chest pain or maximum level of creatine kinase were observed. The mean left ventricular ejection fraction after MI ($EF 48.1 \pm 6.1$ % in G-BMS and 43.6 ± 6.7 % in G-DES; $p = n. s.$) did not differ between the two groups. In G-BMS single stents were deployed in all P, whereas in G-DES 2 stents were used in 2 P. The mean stent diameter was 2.78 ± 0.23 millimetres (mm) in G-BMS and 2.86 ± 0.12 mm in G-DES ($p = n. s.$), the mean stent length was 15.4 ± 2.4 mm in G-BMS and 27.1 ± 5.1 mm in G-DES ($p < 0.01$). In all P ASC-transplantation was performed without complications 5.5 ± 1.2 days after primary PCI. The mean minimal lumen diameter (MLD) of the stented segment, as calculated by QCA after ASC-transplantation, did not differ between the groups (2.67 ± 0.39 mm in G-BMS; 2.45 ± 0.35 mm in G-DES; $p = n. s.$). Angiography after 6 months revealed a significant ISR (≥ 50 %) in 4 P in G-BMS (50 %) and in 1 P in G-DES (14 %). The late lumen loss was 1.59 ± 0.9 mm in G-BMS compared to 0.32 ± 0.72 mm in G-DES ($p < 0.01$). The plaque volume of the stented segment increased significantly from 0.56 ± 0.67 mm³ to 18.67 ± 12.44 mm³ in G-BMS compared to G-DES (from 1.81 ± 1.13 mm³ to 3.81 ± 4.64 mm³; $p < 0.05$). No significant differences in LVEF between the two groups were found after 6 months (54 ± 6 % in G-BMS and 53 ± 9 % in G-DES; $p = n. s.$), but in both groups LVEF improved significantly compared to baseline.

Conclusion Compared to BMS, DES seem to diminish intima-hyperplasia also after transcatheter transplantation of G-CSF mobilised ASC following primary stent implantation for acute MI.

XI-2

088

Combined (Intramyocardial plus Intracoronary) Autologous Bone Marrow-Derived Stem Cell Therapy Has Beneficial Effects in Patients with Recent Acute Myocardial Infarction

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Background Experimental and clinical evidences suggest that application of autologous bone marrow-derived stem cells (BM-SCs) beneficially affects the myocardial function and perfusion in patients with recent acute myocardial infarction (AMI).

Hypothesis The aim of the present study was to evaluate the efficacy of combined, intramyocardial (i. m.) and intracoronary (i. c.) administration of the autologous, non-selected bone marrow-derived mononuclear cells (BM-MNC) on systolic and diastolic left ventricular function as well as the extent of pharmacological stress-induced and resting myocardial ischaemia in patients with recent AMI.

Methods Sixteen patients (94 % men, mean age: 45.4 ± 10.9 years) underwent NOGA endocardial mapping-guided percutaneous i. m. and i. c. autologous BM-SCs therapy (total cell number: $1.44 \times 10^{10} \pm 3.19 \times 10^{10}$; CD34⁺ cell number: $5.93 \times 10^7 \pm 2.76 \times 10^7$) 3 to 6 weeks after onset of AMI and primary percutaneous coronary intervention (PCI) of the infarct related artery. Baseline and 6-month follow-up determination of size of resting and stress-induced perfusion defects expressed as % of the entire myocardium (by 99mTc-MIBI-persantin-perfusion scintigraphy), evaluation of global left ventricular ejection fraction (EF) and end-diastolic volume (EDV) (by contrast ventriculography), invasive measurement of left ventricular end-diastolic pressure (EDP) as well as determination of diameter of left atrium (LA), and end-diastolic diameter of left ventricle (EDD) (by 2D echocardiography) were performed in all patients.

Results At 6-month follow-up in addition to clinical improvement (NYHA functional class from 1.94 ± 0.81 to 1.33 ± 0.50 ; $p < 0.05$), the perfusion defect size decreased significantly ($p < 0.05$) at rest (from 32.1 ± 5.7 % to 28.3 ± 9.6 %), and during stress (from 36.5 ± 8.1 % to 32.1 ± 9.0 %). The global EF (from 48.3 ± 8.0 % to 49.8 ± 11.4 %; n. s.) did not change, however the EDP (from 23.8 ± 8.5 mmHg to 18.5 ± 10.3 mmHg; $p < 0.05$) and the diameter of LA (from 45.6 ± 5.8 mm to 40.4 ± 6.7 mm; $p < 0.05$) decreased significantly, reflecting an improvement of diastolic left ventricular function. A significant decrease in EDV at follow-up (from 222.3 ± 45.8 ml to 200.8 ± 50.0 ml; $p < 0.05$) and EDD (from 52.8 ± 4.5 mm to 48.5 ± 6.1 mm; $p < 0.05$) suggests a beneficial effect on left ventricular remodelling.

Conclusion In patients with recent AMI and open infarct related artery after primary PCI combined (i. m. + i. c.) autologous BM-SCs transplantation improves myocardial perfusion, the clinical status and the diastolic left ventricular function as well as prevents the unfavourable process of left ventricular remodelling.

XI-3

115

Increased Serum Interleukin-18 Levels in Type 2 Diabetic Patients with Symptomatic Peripheral Occlusive Arterial Disease

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Aims/Hypothesis To compare serum Interleukin-(IL-) 18 levels in patients with type 2 diabetes and peripheral arterial occlusive disease (PAOD) with those in age-matched control patients suffering from PAOD without diabetes and investigate whether IL-18 is correlated with well established markers of vascular inflammation.

Materials and Methods We measured serum IL-18 levels in 42 type 2 diabetes patients with PAOD and in 42 patients with PAOD without diabetes. We also measured serum levels of C-reactive protein (CRP), monocyte-chemoattractant-protein-1 (MCP-1), IL-6 and IL-8 as well as plasma levels of tissue-type plasminogen-activator (tPA), tissue factor (TF), tissue factor pathway inhibitor (TFPI) and fibrinogen.

Results Serum IL-18 was significantly higher in diabetic patients with PAOD than in those with PAOD but without diabetes. PAOD with type 2 diabetes: 394.5 (255.0 – 555.4) pg/ml vs. PAOD without diabetes: 210 (96.4 – 289.5) pg/ml (median and interquartile range; $p = 0.000$). IL-18 correlated with the occurrence of crural PAOD, body mass index (BMI), HbA_{1c} and serum triglycerides levels. As assessed by multivariate analysis IL-18 was identified as the single most predictive factor for the presence of type 2 diabetes in our PAOD patients.

Conclusions/Interpretation In patients with PAOD, serum IL-18 levels are significantly higher in those patients with concomitant type 2 diabetes than in those without diabetes. Serum IL-18 is independently associated with type 2 diabetes in PAOD patients. These findings are not confounded by other markers of vascular inflammation such as IL-6, IL-8, CRP, or MCP-1.

XI-4

100

Differential Regulation of Platelet Activation and Proinflammatory Markers by the Degree of Carotid Stenosis

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Background Optimal therapy for asymptomatic high-grade carotid stenosis (CS) is still controversial. Next to clinical endpoint data, prothrombotic and proinflammatory biomarkers may guide antithrombotic and antiinflammatory therapy at this state of cerebrovascular disease (CVD). Here we studied prothrombotic and proinflammatory biomarkers in asymptomatic CVD with various degrees of stenosis.

Material and Methods In 192 patients (mean age $\pm$ std: 72 ± 9) CS was judged angiographically and patients were stratified into three groups by the degree of stenosis: < 80 % (group I; $n = 60$), 80 – 89 % (group II; $n = 91$), and ≥ 90 % (group III; $n = 41$). Proinflammatory (high-sensitivity CRP) and platelet activation markers (sCD40L, monocyte-platelet aggregate [MPA]-formation) were determined by immunoassays and flow cytometry.

Results Soluble CD40L was significantly increased in high-grade CS ≥ 90 % (sCD40L ng/ml; median [interquartile range] group I: 6.67 [1.29 – 10.22]; group II: 6.76 [2.76 – 12.50]; group III: 9.66 [4.67 – 13.02]; $p < 0.05$). In addition, MPA-formation (CD14⁺/CD42b⁺ % group I: 21.98 (18.15 – 26.96); group II: 23.19 (18.90 – 30.16); group III: 29.08 (21.00 – 40.49); $p < 0.05$) and platelet activation as measured by coexpression of CD14⁺/CD40L⁺ (CD14⁺/CD40L⁺ % group I: 65.43 (53.47 – 74.73); group II: 71.56 (61.27 – 78.23); group III: 74.85 (63.87 – 80.44); $p < 0.05$) were also significantly higher in stenosis ≥ 90 % compared to CS between 80 – 89 % and < 80 %. No difference was found for high-sensitivity CRP between various degrees of stenosis.

Conclusion Markers of platelet activation but not inflammation (hsCRP) increase with the severity of carotid stenosis.

XI-5

048

Improvement in Rather Than Single Assessment of Brachial Artery Endothelial Function Predicts Cardiovascular Events in Patients with Coronary Artery Disease

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Background Peripheral endothelial function, assessed by brachial artery flow-mediated dilation (BA-FMD), has been related to cardiovascular risk factors as well as the presence of coronary artery

disease (CAD). The prognostic value of a single FMD measurement for future cardiovascular events is controversial. Whether serial measurements improve the predictive value of this test is unknown.

Methods In a pilot study, 68 patients (mean age 53.7 ± 9.1 years) with angiographically proven coronary artery disease ($\geq 30\%$ stenosis in ≥ 1 major vessel), underwent assessment of FMD at baseline and again after a mean of 14 ± 12 months. Patients were divided into 2 groups: absolute improvement in FMD $\geq 3\%$ (group 1) and $< 3\%$ (group 2). This cut-off value was chosen based on the evaluation of the spontaneous variability which was 3% in 16 CAD patients tested within 3 months. After a mean follow-up of 44 ± 12 months, cardiovascular events (hospitalisation due to angina, repeat coronary angiography revealing *de novo* or significant progression of preexisting stenosis, coronary revascularisation, myocardial infarction, cardiac death) were recorded by phone calls to the patients, followed by review of hospital charts.

Results Baseline characteristics were similar between groups, except the number of risk factors which was smaller in group 1 (1.6 ± 0.7 vs. 2.1 ± 0.8 ; $p < 0.01$). Baseline medication was comparable between groups (use of statins, angiotensin converting enzyme inhibitors, angiotensin-II-receptor antagonists). Cardiovascular events were more frequent in group 2 (9 vs. 1 event; $p < 0.05$). In Kaplan-Meier analysis, the difference was only borderline significant ($p = 0.08$), due to the small number of subjects. When patients were divided according to the single baseline median FMD value, no significant difference in the number of events was found between groups (4 vs. 6 events; $p = 0.49$). Cox regression analyses did not reveal any significant relation between changes in FMD or baseline risk factors and outcome.

Conclusion These data suggest that an increase in FMD is associated with improved outcome in CAD patients. Change in FMD may be a better predictor of future cardiovascular events and may more accurately reflect susceptibility of the vasculature for cardiovascular risk factors than a single FMD measurement.

XI-6

001

The Impact of Haemoglobin and Serum Creatinine Levels on Clinical Outcome in Acute Coronary Syndromes

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Background Lower levels of haemoglobin as well as renal dysfunction are associated with decreased survival rates in patients with hypertension, heart failure or ischaemic heart disease. However, data about an association of anaemia and elevated levels of serum creatinine (Scr) increasing mortality in acute coronary syndromes (ACS) differ a lot. Based on knowledge of the interaction between ischaemic heart disease, anaemia and renal function we examined the impact of haemoglobin (hb) and Scr levels on clinical outcome in ACS.

Methods In a prospective study of 116 consecutive patients (mean age 74 ± 13 years; 65 female) admitted with an ACS, we analysed the relationship of hb and Scr levels to in-hospital mortality. The participants were classified according to their hb level on admission (hb < 13 g/dl, n = 52; 44.83 %; hb ≥ 13 g/dl, n = 64; 55.17 %).

Results The overall in-hospital mortality was 12.93 %. The in-hospital mortality in patients with hb levels on admission < 13 g/dl was 21.15 % vs. 6.25 % in patients with hb levels ≥ 13 g/dl ($p < 0.025$) and 29.41 % in patients with Scr levels > 1.5 mg/dl (n = 34; 29.31 %) vs. 6.10 % in patients with Scr levels < 1.5 mg/dl (n = 82; 70.69 %); ($p < 0.001$). Patients with anaemia and/or elevated Scr were 10–12 years older. We observed no significant difference regarding time of onset of chest pain, peak myocardium-bound creatinine kinase levels, initial heart rate and treatment with ASS and betablockers. Among people with anaemia combined with Scr levels > 1.5 mg/dl there was a significant higher in-hospital mortality (39.13 %; $p < 0.001$) as compared to patients with anaemia and Scr levels < 1.5 mg/dl (3.77 %).

Conclusions In ACS patients lower levels of haemoglobin have prognostic implications in particular in association with increased Scr levels and advanced age.

Sitzung XII – Interventionelle Kardiologie 2

XII-1

106

Plasminogen Activator Inhibitor-1-Plasma Levels Are Associated with Coronary In-Stent Restenosis of Drug-Eluting Stents

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Background Percutaneous coronary intervention (PCI) represents the most important treatment modality of coronary artery stenosis today. Although with the introduction of drug-eluting stents (DES) in-stent restenosis (ISR) could be reduced dramatically, it still plays a significant role in the long-term outcome after PCI. The fibrinolytic system is believed to be of pathophysiological relevance in the development of ISR.

Methods We studied 75 patients (median age 64 years, 56 male). Blood samples were taken directly before and 24 hours after PCI with DES implantation. Restenosis was evaluated at 6 to 8 months by coronary angiography.

Results During the follow-up period, 2 patients (2,7 %) died of cardiovascular causes and ISR was detected in 12 patients (16 %). At baseline, patients with ISR at follow-up angiography showed significantly lower plasma levels of PAI-1 active antigen compared to patients without ISR (11.7 ± 8.1 vs. 22.8 ± 18.8 ; $p < 0.05$). Patients with PAI-1 active antigen in the lowest tertile showed a 9.5-fold risk of ISR compared to patients in the third tertile ($p < 0.05$). The PCI-induced change of PAI-1 active antigen was significantly higher in patients with ISR as compared to patients without ISR ($+5.6 \pm 8.0$ ng/mL vs. -3.2 ± 12.1 ng/mL; $p < 0.05$). Multiple regression analysis revealed that late lumen loss was associated with the PCI-induced change of PAI-1 active antigen and inversely correlated with PAI-1 active antigen before PCI independent from stent diameter, stent length, type of stent, number of stents, stented vessel as well as presence of diabetes.

Conclusion The occurrence of ISR showed a significant correlation with baseline plasma levels of PAI-1 active antigen before PCI and the change of PAI-1 active antigen due to PCI. As PAI-1 may play a role in the pathogenesis of ISR, determination of PAI-1 plasma levels might be helpful in the identification of patients with high risk for development of IRS after DES implantation.

XII-2

089

Safety of Bivalirudin in Patients with Chronic Renal Insufficiency after Percutaneous Coronary Interventions with Stent Implantation

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Background Chronic renal insufficiency is associated with an increased risk of ischaemic events and bleeding complications after percutaneous coronary intervention (PCI). The direct thrombin inhibitor bivalirudin provides comparable suppression of ischaemic events with a decrease in bleeding complications compared with heparin. However, the effect of impaired renal function on the safety and efficacy of bivalirudin for PCI is unknown. Therefore the aim of our study was to evaluate the safety of bivalirudin in patients with renal dysfunction undergoing PCI with stent implantation to compare the clinical outcome with patients having normal kidney function.

Methods The in-hospital clinical outcome events of 135 patients receiving bivalirudin (0.75 mg per kg bolus with 1.75 mg per kg per hour periprocedural infusion) during coronary intervention including stenting were recorded in 2 Austrian centers. Patients with moderate renal dysfunction (defined as repeated serum creatine value > 1.2 mg/dl) were classified into group 1 (n = 39; 74 % male), vs. patients with normal renal laboratory parameters (group 2; n = 86; 71 % male).

Results Patients in group 1 were older (70 ± 12 vs. 65 ± 10 years; $p < 0.05$), had more often diabetes mellitus (51 % vs. 26 %; $p < 0.01$) and previous PCI (43 % vs. 20 %; $p < 0.01$) as compared with patients in group 2. No differences were found between the groups regarding the other coronary risk factors, number of diseased vessels, final TIMI flow, blood coagulation parameters pre- and post-PCI, or use of closure device after PCI. The post-PCI creatine values did not change in the groups (pre-PCI: 1.6 ± 0.7 vs. 1.0 ± 0.2 mg/dl, post-PCI: 1.6 ± 0.9 vs. 1.1 ± 0.2 mg/dl). The in-hospital bleeding events (2.5 % vs. 1.1 %), target vessel revascularisation (2.5 % vs. 2.3 %), acute stent thrombosis leading to cardiac death (0 % vs. 2.3 %) were similar in groups 1 vs. 2, respectively. The composite endpoints of the major adverse cardiac events and bleeding complication was 5.1 vs. 5.8 % in group 1 vs. 2.

Conclusion Procedural anticoagulation with bivalirudin during PCI is safe in patients with moderate renal insufficiency, and may replace the conventional unfractionated heparin use in chronic moderate renal impairment.

XII-3

056

In-Hospital Outcome After Primary PCI for ST-Elevation Myocardial Infarction in the Elderly: the Austrian Acute PCI Registry

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Background Primary PCI (P-PCI) is the preferred reperfusion modality for ST-elevation myocardial infarction (STEMI) and has been shown in randomised studies to be effective both in younger and elderly patients (pts). However, few data are available on the differences in primary success rate and mortality between elderly and younger pts in the real world setting of P-PCI.

Methods 1005 pts (mean age 62 ± 13 years) undergoing P-PCI within 24 hours of symptom onset were recorded between January and December 2005 in a multicentre registry including 19 PCI hospitals in Austria. Recorded variables included baseline demographics, cardiovascular risk factors, anti-thrombotic therapy (aspirin, heparin, clopidogrel, GPIIb/IIIa) and time delays. Outcome data included primary angiographic success (TIMI-II- and -III-flow) and in-hospital mortality. Results were analysed in the elderly patients (age ≥ 70 ; n = 304) and compared with the remainder (n = 701).

Results Mortality was higher in the elderly compared with the younger pts (11.5 % vs. 4.0 %; $p < 0.001$). Elderly pts more often underwent multi-vessel PCI (10.5 % vs. 6.4 %; $p = 0.028$), whereas stent rate (83.6 % vs. 88.3 %; $p = 0.043$) and primary success rates (88.6 % vs. 95.5 %; $p = 0.0002$) were lower in the elderly. No significant differences were found in the frequency of shock (11.5 % vs. 8.5 %), diabetes (14.5 % vs. 10.4 %) or prior MI (8.6 % vs. 9.3 %) between groups. Anti-thrombotic medication rates and pre- and in-hospital time delays were similar in elderly and younger pts. In logistic regression analysis including gender, known diabetes, shock, prior MI, smoking status and age, only the presence of shock ($p < 0.0001$), age (< 70 vs. ≥ 70 ; $p = 0.002$) and the angiographic success rate ($p = 0.028$) remained associated with mortality.

Conclusion In-hospital mortality is substantially higher in the elderly compared with younger pts undergoing P-PCI for STEMI in this multicentre registry. In addition to age, the presence of cardiogenic shock and primary angiographic success is independently associated with mortality. The lower primary success rates and more frequent multi-vessel PCI in the elderly suggest more advanced coronary disease with more complex P-PCI interventions performed in this subgroup.

XII-4

073

Geschlechtsunterschiede im Linzer Akut-PCI-Registry

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Einleitung Bei akutem ST-Hebungsinfarkt (STEMI) stellt die rasche Wiedereröffnung des Infarktgefäßes mittels primärer perkutaner Intervention (PCI) eine entscheidende Maßnahme dar. Verschiedentlich wurden dabei unterschiedliche Ergebnisse im Vergleich zwischen Männern und Frauen beschrieben. Wir analysierten die Daten des Linzer primären PCI-Registers hinsichtlich des Vorliegens von geschlechtsspezifischen Unterschieden.

Methode und Ergebnisse Insgesamt wurden zwischen Oktober 2000 und Dezember 2003 415 Patienten mit STEMI, davon 290 Männer (69,9 %) und 125 Frauen (30,1 %) behandelt. Frauen waren signifikant älter als Männer ($73 \pm 11,4$ vs. $61 \pm 12,8$ Jahre; $p < 0,0001$). Nach dem klinischen Zustand bei Aufnahme (Schock, präklinische Reanimation, Intubation) wurden 20 (16 %) Frauen vs. 54 (18,6 %) Männer einer Hochrisikogruppe und 105 (84 %) Frauen vs. 236 (81,4 %) Männer einer Niedrigrisikogruppe zugeteilt ($p = n. s.$). Das mediane Delay zwischen Schmerzbeginn und Aufnahme im Krankenhaus betrug bei Frauen 180 min, bei Männern 120 min ($p = 0,04$). Auch unter Berücksichtigung des Alters mittels logistischer Regression blieb dieser Delayunterschied grenzwertig signifikant ($p = 0,053$). Kein signifikanter Unterschied bestand dagegen bei den medianen Delayzeiten zwischen Krankenhausaufnahme und Eintreffen im Herzkatheterlabor (Frauen: 45 min, Männer: 40 min, $p = 0,94$). Auch bezüglich Infarktlokalisierung, Rate an Akutinterventionen (Frauen: 95,2 %, m: 94,8 %; $p = 0,87$), Stentanzahl (Frauen: 87,2 %, Männer: 89 %; $p = 0,61$), angiographischem Erfolg (Frauen: 88,8 %, Männer: 91,4 %; $p = 0,41$) und TIMI-III-Fluß nach Intervention (Frauen: 88 %, Männer: 89,7 %; $p = 0,58$) bestanden keine geschlechtsspezifischen Unterschiede. Die Rate an postinterventionellen Komplikationen (Frauen: 18,4 %, Männer: 14,8 %; $p = 0,36$), die Intrahospitalmortalität (Frauen: 11,2 %, Männer: 9 %; $p = 0,48$) und die Mortalität bei kardiogenem Schock (Frauen: 60 %, Männer: 36,8 %; $p = 0,23$) waren bei Frauen tendenziell höher, die Unterschiede erreichten aber keine Signifikanz.

Konklusion Frauen mit Myokardinfarkt wiesen gegenüber Männern längere Delayzeiten zwischen Schmerzbeginn und Krankenhausaufnahme auf, während intrahospitale Delayzeiten und Interventionsraten vergleichbar waren. Komplikationsraten und Intrahospitalmortalität nach perkutaner Intervention erschienen bei Frauen tendenziell höher.

XII-5

039

Etablierung der transradialen Herzkathetertechnik am LKH Salzburg

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Einleitung Im Februar 2005 haben wir im LKH Salzburg (LKHS) mit dem regelmäßigen radialen Zugang bei elektiven und akuten Koronarangiographien begonnen. Die Gründe hierfür waren Verbesserung des Patientenkomforts, Verminderung von Komplikationen und Verkürzung von Liegedauer. Der radiale Zugang bietet im Vergleich zum femoralen spezifische Probleme, die eine längere Lernkurve bedingen. Wir berichten über unsere Erfahrungen mit der Etablierung dieser Methode.

Patientenauswahl und Ergebnisse Die Entscheidung, welcher Patient (Pat.) radial untersucht wird, fällt am Kathetertisch. 3/6 Untersuchern am LKHS sind mittlerweile mit der Methode vertraut. Kriterien, die für einen radialen Zugang sprechen, sind ausdrücklicher Patientenwunsch, Adipositas, Dyspnoe, Beschwerden beim Liegen und höheres Lebensalter.

Im beobachteten Zeitraum (12 Monate) wurden am LKHS 2497 Herzkatheteruntersuchungen durchgeführt. 50,2 % mündeten in einer Koronarintervention. 515 Pat. (20,6 %) wurden radial untersucht,

davon waren 43,1 % Interventionen, 9,5 % akut oder dringlich. Mit wachsender Sicherheit im Umgang mit der Technik wurden auch zunehmend Pat. mit hoher Vortestwahrscheinlichkeit oder bekannter KHK *ad interventionem* radial angegangen.

Die primär radial punktierten Pat. waren älter (66,5 vs. 65,4 J) und häufiger Frauen (41 vs. 34,4 %) als die femoral untersuchten. Die vorgefundene Koronarmorphologie beider Gruppen war vergleichbar. Die mittlere Durchleuchtungszeit war von radial länger (8 vs. 7 min), ebenso die Gesamtdauer der Prozedur (48 vs. 42 min). Dabei unterschieden sich die 3 analysierten Untersucher in Abhängigkeit von ihrer Erfahrung mit der Technik und ihrer Untersuchungsfrequenz. Die Lernkurven werden präsentiert.

Der geplante radiale Zugang war in 27 Fällen (5,2 %) nicht möglich. Die Gründe waren u. a. Fehlpunktionen, Radialisaspien und Gefäßanomalien. Auch hier war eine Abnahme über die Zeit erkennbar. Die radiale Komplikationsrate war insgesamt gering (ca. 1 %). Es gab keine schwerwiegenden Ereignisse. Es erfolgt ein Vergleich mit den femoralen Komplikationen.

Schlussfolgerungen Die radiale Herzkatheteruntersuchung kann in der täglichen Routine sicher durchgeführt werden. Im ersten Jahr ist mit längeren Untersuchungs- und Durchleuchtungszeiten und technischen Problemen zu rechnen. Mit zunehmender Erfahrung sind auch komplexe Interventionen wie Multivessel- und Hauptstamm-PCI gut durchführbar. Neben der höheren Patientenzufriedenheit kann auch mit weniger postoperativen Komplikationen gerechnet werden.

XII-6

067

Transradiale Interventionen im ACS

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Einleitung Die transradiale Kathetertechnik wurde im LKH Salzburg seit Beginn 2005 implementiert. Mit zunehmender Sicherheit im Umgang mit der Methode wurden auch Akuteingriffe über diesen Weg durchgeführt. Hintergrund dafür sind potentielle Vorteile, insbesondere bei antikoagulierten, lysierten oder mit GPIIb/IIIa-Antagonisten behandelten Patienten im Hinblick auf Blutungs- oder Punktionskomplikationen. Wesentlich ist auch, ob die Untersuchungsdauer im Akutfall durch die transradiale Methode in klinisch signifikantem Ausmaß verzögert wird und inwieweit die Erfolgsrate der Koronarintervention von transradial mit der des transfemorale Zugangs vergleichbar ist.

Patientencharakteristika und Methode n = 93; 66 (71 %) Männer, Alter 64,2 Jahre; 27 Frauen (29 %), Alter 72,5 Jahre. 33 STEMI (36 %) (davon ein LSB) und 59 NSTEMI (63 %), 1 kardiogener Schock.

Im Rahmen des Akut-PTCA-Registers der ÖKG sind 2005 24 (11,8 %) der 204 Patienten transradial erfaßt worden. Zusätzlich antithrombotisch behandelte Patienten: 40 (43 %), davon

- chronisch orale Antikoagulation: 3 (3,2 %)
- Prähospital Lyse (Rescue-PTCA): 4 (4,3 %)
- Upstream GPIIb/IIIa: 10 (10,8 %)
- GPIIb/IIIa zur Intervention: 23 (24,7 %)

Alle Patienten wurden bezüglich ihres Radialis pulses auf eine ausreichende kontralaterale Durchblutung über die Arteria ulnaris (Allentest oder fehlender Fingerbeerensättigungsabfall bei Kompression der Arteria radialis) vorgetestet. Routinemäßig wurden transradiale 6F-Schleusen und 6F-Katheter verwendet. Alle Patienten waren bereits mit Aspirin, Clopidogrel und in der Regel UFH oder LMWH anbehandelt, 3 Patienten waren mit Bivalirudin behandelt.

Ergebnisse Untersuchungszeit 59 min $\pm$ 27,5 (vgl. transfemorale Akute n = 337 in 2005: 50,4 $\pm$ 37,8); Durchleuchtungszeit 11,7 min $\pm$ 8,6 min (vgl. transfemorale Akute in 2005: 9,6 $\pm$ 8,79). 81 der 93 Patienten wurden interveniert (87,1 %), davon 77 erfolgreiche PCIs (95,1 %; vgl. Erfolgsrate transfemorale 96 %), 1 Patient wurde akut bypassoperiert und nicht interveniert, 11 Patienten wurden konservativ therapiert.

Untersuchung transradial erfolgreich zu Ende gebracht: 87 (93,5 %); Notwendigkeit des Wechsels auf die kontralaterale Radialis: 1

(1,1 %); Notwendigkeit des Wechsels auf einen transfemorale Zugang: 6 (6,5 %); Blutungskomplikationen: 0 (0 %) (vgl. transfemorale Akute in 2005: 3 (1,0 %) Aneurysma spurium).

Sonstige Komplikationen an den Punktionsarterien: 2 (2,2 %) 1x Perforation eines Seitenastes der A. radialis (Management: Kompression) und 1x Dissektion (Management: konservativ) zeigten einen blauen komplikationslosen Verlauf während des stationären Aufenthalts und bedurften keiner Operation. Vgl. transfemorale Akute in 2005: 1 (0,32 %) Perforation mit retroperitonealer Blutung und Bauchdeckenblutung.

Schlussfolgerung Trotz der verhältnismäßig kurzen Gewöhnungszeit kann die Methode sicher und effizient im Akutfall angewandt werden. Neben den im Akutfall nicht so sehr im Vordergrund stehenden Vorteilen, wie Patientenakzeptanz und Komfort, zeigen sich in dieser kleinen Kohorte für den transradialen Zugangsweg objektiv keine schwerwiegenden Blutungs- und Gefäßkomplikationen bei vergleichbarer prozeduraler Erfolgsrate. Die Notwendigkeit, auf transfemorale zu wechseln, bewegt sich in der gleichen Größenordnung wie in den Kohorten der elektiven Untersuchungen.

Die Untersuchungszeit und Durchleuchtungszeit sind bei der transradialen Methode unwesentlich verlängert. Die Erfolgsrate der Interventionen unterscheidet sich nicht von der des femoralen Zugangs.

XII-7

040

Transradialer Zugang bei Octogenarians – einjährige Erfahrungen an einem Zentrum

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Einleitung Ein Alter über 80 Jahre ist bei Herzkatheteruntersuchungen und -interventionen ein relevanter Risikofaktor für prozeduralen Mißerfolg und Komplikationen. Es gibt Hinweise, daß ein radialer Zugang auch bei älteren Patienten (Pat.) mit hohem Erfolg angewendet werden kann und dabei sogar weniger Komplikationen auftreten als von femoral. Am LKH Salzburg (LKHS) wird der radiale Zugang seit Februar 2005 angewendet. Wir berichten über unsere ersten Erfahrungen mit der Technik bei den Octogenarians.

Patienten Insgesamt wurden in den vergangenen 12 Monaten 300 Pat. > 80 Jahren am LKHS koronarangiographiert. Davon wurden 65 (22 %) primär radial und 235 (78 %) femoral punktiert. Die demographischen, klinischen und koronarmorphologischen Eckdaten zwischen radial und femoral untersuchten Octogenarians werden verglichen: Altersmedian (83,5 und 83,2 Jahre), Frauen (60 und 66 %), akute/dringliche Untersuchung (27 und 35 %), Dreigeäß- und/oder Hauptstamm-KHK (34 % und 38 %). In der Mehrzahl der Fälle (64 %) erfolgte bei den radial untersuchten Pat. > 80 Jahren eine Empfehlung zur Koronarintervention.

Ergebnisse Die primär radial geplante Koronarangiographie wurde bei 62/65 der Octogenarians erfolgreich durchgeführt (95 %). Bei 3 Pat. mußte wegen Zugangsproblemen auf femoral gewechselt werden (1 Radialisperforation, 2 Gefäßanomalien). Andererseits wurde auch bei 3 Pat. wegen Unpassierbarkeit der A. iliaca von femoral auf radial gewechselt. Die Koronarintervention wurde wie vorgesehen bei 44/45 Pat. einzeln auch von radial durchgeführt. Lediglich ein Pat. wurde elektiv zu einem späteren Zeitpunkt von femoral interveniert (Rotablation). Bei 3 Pat. > 80 Jahren erfolgte sogar eine Hauptstammintervention von radial mit intraaortaler Ballonpumpe über die Leiste. In 2 Fällen traten postoperative Probleme auf (3 %): Die Pat. mit der Radialisperforation erlitt einen anhaltenden, aber asymptomatischen Verlust des Radialis pulses. Eine weitere Pat. hatte ein größeres Unterarmhämatom, welches gut mit Blutegeln behandelt werden konnte.

Schlussfolgerung Bei Octogenarians können Herzkatheteruntersuchungen und -interventionen zu einem hohen Prozentsatz erfolgreich durchgeführt werden. Selbst komplexe Eingriffe wie Hauptstamminterventionen stellen nach unserer Erfahrung keine Kontraindikation für den radialen Zugang dar.

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080

Stenting of Aortic Coarctation: a Ten-Year Follow-Up

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Background Stent implantation for the treatment of aortic coarctation is a field of increasing importance in adolescent and adult congenital heart disease. While balloon coarctation angioplasty has been considered an alternative to surgery, stent implantation is evolving now as the treatment of choice for coarctation in the adolescent and adult patient. Moreover, the availability of covered stents offers new interventional perspectives, extending the technique to long and extreme subatretic forms of coarctation. We hereby report our 10-year experience with stenting of aortic coarctation.

Patients and Methods In our institution, 16 patients (13 male [81 %]; mean age 29 ± 16 years, age range 13–64 years) underwent stent implantation for the treatment of aortic coarctation between July 1996 and December 2005. 6 patients (37.5 %) underwent the procedure for native coarctation of the aorta, another 6 patients presented with recurrent coarctation after surgical repair, 3 patients (19 %) had developed recoarctation after previous balloon angioplasty, and 1 patient (6 %) had a history of surgical repair and balloon angioplasty. From 1996 until 2003 10 Palmaz stents (lengths 40–50 mm) were implanted in 9 patients. Since 2004, the coarctations of 7 patients were treated with Cheatham platinum (CP) stents (lengths 28–39 mm; 2 covered stents). A bicuspid aortic valve was the most frequent anomaly associated with aortic coarctation.

Results Stent implantation was successful in all cases. The minimal narrowing of the stenosis before stent implantation was 7 ± 2 mm (range 3–10 mm). Prestenotic aortic diameter was 15 ± 5 mm (range 8–27 mm), poststenotic diameter was 21 ± 7 mm (range 13–37 mm). Stents could be dilated to a diameter of 15 ± 4 mm (range 9–20 mm). Systolic aortic pressure gradients dropped from 35 ± 15 mmHg (range 10–65 mmHg) to 6 ± 6 mmHg (range 0–19 mmHg), while mean pressure gradients dropped from 13 ± 8 mmHg (range 0–32 mmHg) to 2 ± 3 mmHg (range 0–9 mmHg). The postinterventional course of 1 patient was complicated by a spurious aneurysm of the femoral artery requiring surgical repair. All other patients had an uneventful course. Antihypertensive drug treatment could be reduced in most patients after stent implantation. No reintervention was necessary in any patient so far.

Conclusions Transcatheter therapy of aortic coarctation with stent implantation is safe and effective. Thus, the procedure can be considered the treatment of choice for patients with coarctation from adolescence to adulthood. With the advent of covered stents, even long and extreme subatretic coarctations can be treated. Whether these promising mid-term results can be maintained, needs to be determined.

Der Einfluß des kardiogenen Schocks bei Spitalsaufnahme auf die Mortalität im Zeitalter der akuten Koronarintervention

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Einleitung Die Hospitalletalität des akuten ST-Hebungsinfarktes wird in hohem Maße von der Pumpfunktion bei der klinischen Präsentation determiniert. Patienten mit kardiogenem Schock stellen trotz notfallmäßiger interventioneller Therapie im Rahmen einer 24-h-Angiographiebereitschaft ein Hochrisikokollektiv dar.

Patienten und Methodik Insgesamt wurde an unserer Abteilung eine konsekutive Serie von 432 Patienten (P) einer notfallmäßigen Koronarintervention (Akut-PCI) unterzogen. Davon präsentierten sich 50 P (12 %) bei der Spitalsaufnahme im kardiogenen Schock (Gruppe 1). Die übrigen P waren bei der Aufnahme kreislaufstabil (Gruppe 2). Die Definition des kardiogenen Schocks beinhaltete entweder eine trotz Volumensubstitution ≥ 30 min persistierende Hypotonie mit einem Blutdruck ≤ 90 mmHg oder die Notwendigkeit einer Katecholamintherapie zur Aufrechterhaltung des Blutdrucks und klinische Zeichen der Endorganhypoperfusion. Standardmäßig wurden die Patienten vor der Akut-PCI mit ASS 500 mg und 300 mg Clopidogrel sowie einem Abciximab-Bolus behandelt. Bei prähospital erfolgter systemischer Lyse wurde kein GPIIb/IIIa-Antagonist verabreicht.

Ergebnisse Die klinisch demographischen Daten der P in Gruppe 1 und 2 waren vergleichbar. P der Gruppe 1 wiesen einerseits eine signifikant längere Schmerzdauer von 478 ± 940 min vs. 254 ± 448 min ($p = 0,007$) sowie häufiger eine koronare Mehrgefäßerkrankung auf (58 % vs. 41 %; $p = 0,01$). Die Verteilung der infarktbezogenen Gefäße war in beiden Gruppen vergleichbar: Ramus interventricularis anterior 50 % vs. 47 %, Ramus circumflexus 15 % vs. 16 % und rechte Koronararterie 33 % vs. 34 %, Venengrafts 0 % vs. 2 % sowie Hauptstämme der linken Koronararterie 2 % vs. 1 %. Der Prozentsatz an P, die keinen initialen TIMI-III-Fluß aufwiesen, lag bei 92 % und 91 %. Die linksventrikuläre Auswurfraction betrug 27 ± 21 % vs. 42 ± 23 % ($p = 0,00002$). 20 P (40 %) der Gruppe 1 verstarben im Rahmen des stationären Aufenthalts, hingegen nur 24 P (6 %) der Gruppe 2 ($p < 0,00001$). 18 P (36 %) im Schock wurden periinterventionell mit einer intra-aortalen Ballonpumpe versorgt, 8 primär nicht schockierte P (2 %) der Gruppe 2 entwickelten im Verlauf der Hospitalisierung einen Schock und erhielten eine Ballonpumpe. Interessanterweise konnte bei 6 dieser 8 P ein TIMI-III-Fluß hergestellt werden, 4 dieser 8 P verstarben im Rahmen des Aufenthalts.

Schlußfolgerung Auch im Zeitalter der Akut-PCI weisen P, die sich bei Spitalsaufnahme im kardiogenen Schock präsentieren, eine wesentlich schlechtere Prognose als P ohne Schock auf. Die Schmerzdauer spielt eine entscheidende Rolle und ist bei P mit Schock statistisch signifikant verlängert. Der präinterventionell dokumentierte TIMI-Fluß hat, jedenfalls in unserer Serie, keinen signifikanten Einfluß auf die Mortalität.

Table 6: K. Kalla et al.

	phd ≤ 2 h	phd > 2 h	p-value
Inhospital mortality (%)	7.9	7.6	0.91
Shock (%)	13	10.2	0.285
Anterior wall infarction (%)	49.1	50.7	0.691
Female (%)	26	28.4	0.504
Age (y; mean $\pm$ SD)	60 $\pm$ 13	61 $\pm$ 13	0.547
phd (h; mean $\pm$ SD)	1.3 $\pm$ 0.5	4.8 $\pm$ 2.5	< 0.001
phd (h; median $\pm$ SD)	1.3 $\pm$ 0.5	4 $\pm$ 2.5	< 0.001
dtb (min; mean $\pm$ SD)	77 $\pm$ 46	86 $\pm$ 55	0.021
dtb (min; median)	65	72	0.021

Influence of Prehospital Delay on Door-to-Balloon Time and Impact on Inhospital Mortality in Patients with Acute STEMI Treated with Primary PCI

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Background and Aim The purpose of this analysis was to evaluate if prolonged prehospital delay (phd) influences door to balloon (dtb) times and inhospital mortality in the Vienna STEMI registry.

Patients and Methods In this registry 631 consecutive patients (pts) with acute STEMI of < 12 hours (h) duration underwent primary PCI (PPCI). Phd was calculated as the time from symptom onset to arrival at hospital and dtb time was calculated as the time from arrival at hospital to 1st balloon inflation. According to the median phd of 2 hours (h) pts were divided into 2 different groups, with phd of ≤ 2 h and > 2 h, respectively.

Results Pts with phd of ≤ 2 h had significantly shorter dtb times than patients with phd of > 2 h ($p = 0.021$). In an univariate logistic regression for prediction of inhospital mortality, dtb time was a significant predictor of death in the phd ≤ 2 h group ($p = 0.001$) but not in the phd > 2 h group ($p = 0.256$). In a multivariate analysis including age, shock at presentation, gender, infarct location and dtb time, predictors of mortality in the phd ≤ 2 h were age ($p = 0.001$; OR 1.078), shock ($p < 0.001$; OR 37.123), and dtb time ($p = 0.088$; OR 1.007), while in the phd > 2 h group predictors were age ($p < 0.001$; OR 1.304), shock ($p < 0.001$; OR 1068.072), and infarct location ($p = 0.068$; OR 0.198), but not dtb time ($p = 0.951$; OR 1) (Table 6).

Conclusion In this registry pts with shorter phd had a significant benefit of short dtb in terms of inhospital mortality. On the other hand in pts with prolonged phd additional loss of time for PPCI did not further influence inhospital mortality. Accordingly, in pts with short phd (≤ 2 h) time from 1st medical contact to PPCI is crucial, and should be kept as short as possible.

Gender Differences in Patients with Acute STEMI Treated with Primary PCI or Thrombolytic Therapy and Impact on Inhospital Mortality

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Background and Aim Several studies have shown that among patients (pts) with acute STEMI treated either with thrombolytic therapy (TT) or with primary PCI (PPCI), female gender is associated with worse outcome. The aim of this analysis was to evaluate gender differences in both reperfusion strategies and impact on inhospital mortality.

Patients and Methods In a period of 20 months 912 pts (female [f]: 247, 27.1 %) with acute STEMI of ≤ 12 hours duration were treated with reperfusion therapy according to recent guidelines. 631 (69.2 %; f: 171, 27.1 %) pts underwent PPCI and 281 (30.8 %; f: 76, 27 %) received TT, and gender differences were calculated.

Results As shown in Table 7 female gender was associated with more advanced age and higher inhospital mortality in both treat-

Table 7: M. Gulesserian et al.

Gender differences	PPCI			TT		
	m	f	p-value	m	f	p-value
Inhospital mortality (%)	6.5	12.3	0.018	5.4	15.8	0.005
Anterior wall-infarction (%)	50.3	49.4	0.954	49.3	47.9	0.846
Shock (%)	11.2	13.5	0.419	11.4	16.4	0.267
Age (y; mean $\pm$ SD)	59 $\pm$ 12	66 $\pm$ 14	< 0.001	59 $\pm$ 13	67 $\pm$ 14	< 0.001
Pain to hospital (h; mean $\pm$ SD)	2,9 $\pm$ 2,4	3,0 $\pm$ 2,6	0.58	2,7 $\pm$ 2,3	2,8 $\pm$ 2,3	0.653
Pain to reperfusion (h; mean $\pm$ SD)	4,2 $\pm$ 2,8	4,4 $\pm$ 2,8	0.553	2,4 $\pm$ 1,7	3 $\pm$ 2,1	0.039

ment groups. In the TT group female gender was additionally associated with prolonged time to reperfusion. No significant difference was observed in terms of infarct location, incidence of shock at presentation and times from onset of pain to hospital and to reperfusion, respectively, in both groups. In a logistic regression analysis for prediction of inhospital mortality female gender was no predictor of death in both treatment groups (PPCI: $p = 0.558$; OR 0.758 and TT: $p = 0.430$; OR 1.712). In the PPCI group predictors for mortality were age ($p < 0.001$; OR 1.115), incidence of shock ($p < 0.001$; OR 62.5), time from onset of pain to reperfusion ($p = 0.003$; OR 1.248), and infarct location ($p = 0.059$; OR 0.444), in the TT group predictors were age ($p = 0.001$; OR 1.092) and shock ($p < 0.001$; OR 53.71), respectively. Predictors for mortality in men in the PPCI group were age ($p < 0.001$; OR 1.131), shock ($p < 0.001$; OR 133.328), time from onset of pain to arrival at hospital ($p = 0.019$; OR 0.531), and from onset of pain to reperfusion ($p = 0.001$; OR 2.137) and in the TT group, age ($p = 0.056$; OR 1.062) and shock ($p < 0.001$; OR 33.507). Predictors for mortality in women in the PPCI group were age ($p = 0.004$; OR 1.1), shock ($p < 0.001$; OR 33.678) and time from onset of pain to arrival at hospital ($p = 0.011$; OR 1.342) and in the TT group age ($p = 0.033$; OR 1.136) and shock ($p < 0.001$; OR 176.598).

Conclusion In pts with STEMI women are associated with higher mortality rates compared to men, either treated with PPCI or TT, mainly because of their more advanced age, but female gender did not emerge as an independent predictor of death.

XIII-5

111

Der Einfluß von Bivalirudin (Angiox®) auf katheterbezogene Komplikationen bei perkutaner Koronarintervention (PCI)

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Hintergrund Bivalirudin (Biv) ist ein direkter Thrombininhibitor mit kurzer Halbwertszeit, der sowohl thrombusgebundenes als auch frei im Plasma zirkulierendes Thrombin inhibieren kann. Nach Angaben in der Literatur (ACUITY-, REPLACE-2-Studie) besteht bei Biv und unfractioniertem Heparin (UFH) eine vergleichbare Wirksamkeit bei gleichzeitig reduzierten Blutungskomplikationen. Ziel unserer „Singlecenter“-Studie war es, den Stellenwert von Biv in der klinischen Routine bei der Durchführung von perkutanen Koronarinterventionen (PCI) zu untersuchen.

Material und Methode Zwischen Juli und Dezember 2005 wurden prospektiv die Daten von 213 Patienten (Pat.) nach PCI erfasst und in 2 Gruppen aufgeteilt. Gruppe 1 ($n = 109$ Pat.) erhielt UFH, die Schleuse wurde frühestens nach 6 Stunden entfernt. Gruppe 2 ($n = 104$) erhielt Bivalirudin während der Untersuchung (Bolus: 0,75 mg/kg, Infusion 1,75 mg/kg/Std.), die Schleuse wurde schon nach 2 Stunden entfernt. In jeder Gruppe erhielten je ca. 30 % ein Verschlussdevice (Angioseal®). Die Punktionsstellen von allen an-

deren Patienten in beiden Gruppen wurden von einem speziell geschulten Gefäßteam durch manuelles Abdrücken versorgt.

Ergebnisse Komplikationen traten bei 5,5 % der Patienten in Gruppe 1 bzw. 2,8 % in Gruppe 2 auf ($p = 0,17$). Die Verteilung in den einzelnen Gruppen ist in **Abbildung 6** aufgelistet.

Zusammenfassung Durch die Verwendung von Bivalirudin konnten die Komplikationen (vornehmlich Blutungen) nach PCI ca. um die Hälfte reduziert werden, diese stellt daher eine interessante Alternative zur Verwendung von UFH dar.

XIII-6

097

Differing Time Course of Pro-Thrombotic and Pro-Inflammatory Marker Release After Implantation of Radioactive and Bare Stents

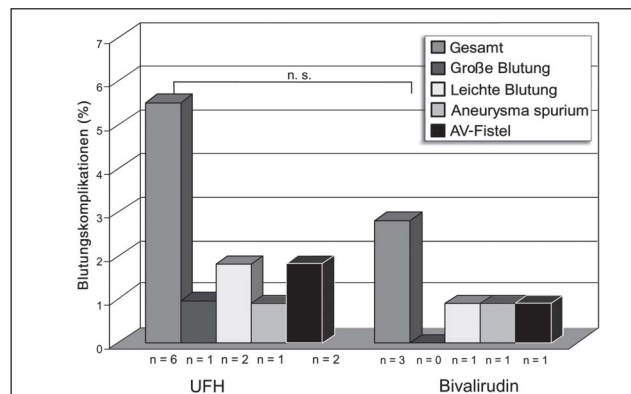
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Background Radioactive coronary stents are known to have a high incidence of restenosis probably due to an unfavourable pattern of radiation-dose distribution. We hypothesise that local irradiation of the vessel wall induces the release of substances that play a major role in inflammatory, thrombotic and atherogenic processes.

Methods In 38 patients who underwent stent implantation for stable coronary artery disease venous blood was drawn before, directly after, 6 h, 12 h, 24 h, 1 month and 6 months after stent implantation. Sixteen patients (42.1 %) received a beta-emitting P-32-impregnated stent (Isostent Inc., USA), and 22 (57.9 %) received a bare stent. Plasma levels of soluble CD40 ligand (sCD40L), P-selectin, vascular cell adhesion molecule 1 (VCAM-1), monocyte chemoattractant protein 1 (MCP-1) and tissue plasminogen activator (tPA) were measured by commercially available human ELISA kits. All patients underwent angiography six months after stent implantation; binary angiographic restenosis was defined as % diameter stenosis > 50 % at follow-up.

Results The two groups did not differ significantly in clinical characteristics, basic angiographic and laboratory parameters. There was a clear trend to an increased restenosis rate in patients receiving radioactive stents (47.1 % vs. 30.4 %; $p = 0.28$). All measured markers increased in both groups immediately after stent implantation. However, the increase in plasma levels of sCD40L, P-selectin, VCAM-1 and tPA was higher and sustained in patients with radioactive stents. The differences reached significance for VCAM-1 after 6 hours (1366.9 ± 675.5 vs. 814.4 ± 487.2 ng/ml; $p = 0.020$), for sCD40L after 24 hours (1105.0 ± 1091.6 vs. 272.0 ± 302.2 ng/ml; $p = 0.034$), for tPA after 1 month (1488.0 ± 1055.4 vs. 591.4 ± 336.1 pg/ml; $p = 0.021$) and for P-selectin after 3 months (29.1 ± 19.7 vs. 12.1 ± 11.6 ng/ml; $p = 0.042$). MCP-1 did not differ significantly at any time after intervention.

**Abbildung 6:** I. Tentzeris et al.

Conclusion The process of inflammation, chemotaxis and thrombosis occurring after coronary interventions seems to be prolonged and more pronounced in patients receiving beta-emitting stents. This corresponds well with histological observations of delayed reendothelialisation and clinical reports on an increased occurrence of thrombosis and restenosis after radioactive stent implantation.

Sitzung XIV – Rhythmologie 2

XIV-1

069

Wie stabil ist die linksventrikuläre Sonde bei CRT-ICD-Patienten im Langzeitverlauf?

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Hintergrund Die kardiale Resynchronisationstherapie (CRT) ist eine etablierte Therapie bei Patienten mit chronischer Herzinsuffizienz im Stadium NYHA III und IV und bestehendem Schenkelblockbild. Der Erfolg der Implantation einer linksventrikulären Sonde wird bestimmt durch die Anatomie der Koronarvenen und ist gekennzeichnet durch Elektrodenstabilität und beständige Reizschwelle. In zunehmendem Maße werden Systeme mit zusätzlichem Kardioverter-Defibrillator (CRT-ICD) implantiert. Ziel dieser Analyse war die Beurteilung (1) der Stabilität der LV-Sonde im Langzeitverlauf und (2) der Einflußparameter (Grundkrankheit, Größe des linken Ventrikels [LVEDD] und Sondenlage) auf die linksventrikuläre Reizschwelle bei Implantation und im Langzeitverlauf.

Methodik Zwischen 01/2002 und 02/2006 wurden an der Medizinischen Universitätsklinik Graz insgesamt 301 ICD-Implantationen bzw. Aggregatwechsel durchgeführt, 64 (21 %) hatten zusätzlich eine Indikation für eine kardiale Resynchronisationstherapie. Das Alter der Patienten war 65 ± 9 Jahre, die Genese in 55 % eine koronare Herzkrankheit, die mittlere linksventrikuläre Auswurf-fraktion 24 ± 7 %, der LVEDD $65 \pm 7,8$ mm und die QRS-Breite 168 ± 24 ms. In 39 % lag eine primärprophylaktische Indikation vor.

Ergebnisse Die LV-Sondenplatzierung war in 90,6 % erfolgreich; intraoperative Werte waren: LV-Sensing $12,4 \pm 6,8$ mV, LV-Impedanz 806 ± 355 und LV-Reizschwelle $1,4 \pm 0,8$ V bei 0,5 ms. Grundkrankheit, Größe des linken Ventrikels und Sondenposition hatten keinen Einfluß auf das intraoperative LV-Sensing und die LV-Reizschwelle. In einem medianen Nachbeobachtungszeitraum von 15 Monaten verstarben 4 Patienten, bei 3 wurde eine Herztransplantation durchgeführt. Bei einer Patientin trat im Follow-up eine LV-Sondendislokation auf. Die linksventrikuläre Reizschwelle war nach anfänglicher postoperativer Erhöhung stabil im Langzeitverlauf und entsprach den Meßwerten bei der Implantation (postoperativ $1,7 \pm 1,2$ V; nach 3 Monaten $1,4 \pm 1,3$ V; letzte Nachsorge $1,3 \pm 0,8$ V bei 0,5 ms).

Schlußfolgerung Unsere Analyse zeigt, daß die LV-Sonde stabile elektrodenbezogene Meßparameter im Langzeitverlauf aufweist, welche unabhängig von Grundkrankheit, Größe des linken Ventrikels und der Sondenposition sind. Zur Batterieersparnis wäre nach einer Einheilungsphase von 3 Monaten eine Programmierung der LV-Stimulationsenergie knapp oberhalb der LV-Reizschwelle möglich.

XIV-2

068

Arrhythmogene rechtsventrikuläre Kardiomyopathie – erhöhtes Risiko für Fehlwahrnehmungen ventrikulärer Ereignisse bei Patienten mit ICD?

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Hintergrund Die arrhythmogene rechtsventrikuläre Kardiomyopathie (ARVC) ist eine seltene, genetisch determinierte Herzmuskelerkrankung, die durch Degeneration und fibrolipomatösen

Umbau des rechtsventrikulären Myokards gekennzeichnet ist. Bei Patienten mit ARVC können rezidivierende ventrikuläre Tachykardien zu Synkopen oder zum plötzlichen Herztod führen. Für diesen Fall stellt ein implantierbarer Kardioverter-Defibrillator (ICD) die Therapie der Wahl dar. Durch die fibrolipomatöse Umwandlung des rechtsventrikulären Myokards kann es intraoperativ schwierig sein, eine geeignete Sondenposition zu finden, wodurch es zu unzureichender Erkennung von Kammertachykardien oder Kammerflimmern kommen kann. Ziel dieser Untersuchung war die Beurteilung der Stabilität rechtsventrikulärer elektrodenbezogener Meßparameter sowie die Evaluierung etwaiger Fehlwahrnehmungen ventrikulärer Ereignisse im Langzeitverlauf.

Patienten und Methodik In einer retrospektiven Studie wurden 13 Patienten (10 Männer, Alter 55 ± 18 Jahre) mit gesicherter ARVC (laut Diagnosekriterien der „International Society and Federation of Cardiology“) und implantiertem ICD über einen Zeitraum von 45 ± 27 Monaten analysiert. Die mittlere LVEF betrug 66 ± 11 %, der QRS-Komplex 118 ± 32 ms (gemessen in V_1). Die zur ICD-Implantation führende Arrhythmie war in 11/13 Patienten eine Kammertachykardie (Zykluslänge 291 ± 46 ms). Bei zwei Patienten trat als Primäreignis Kammerflimmern auf. Für die Analyse wurden die elektrodenbezogenen Meßwerte nach der Einheilungsphase (3 Monate nach ICD-Implantation) mit den Werten der letzten Kontrolle im Beobachtungszeitraum verglichen. Spontan auftretende ventrikuläre Ereignisse wurden auf ventrikuläres Undersensing geprüft.

Resultate Elektrodenbezogene Meßwerte intraoperativ waren: R-Welle $11,2 \pm 4,2$ mV, Impedanz 958 ± 381 W und Reizschwelle $0,62 \pm 0,33$ V bei 0,5 ms. Bei einem Patienten wurde wegen Infektion eine Aggregatverlagerung auf die kontralaterale Seite durchgeführt, ein Patient erhielt im Rahmen eines Aggregatwechsels bei Verdacht auf Isolationsdefekt eine neue Sonde und eine Patientin hatte im Langzeitverlauf einen Sondenbruch mit Sondenneueimplantation. Im Nachbeobachtungszeitraum gab es keine signifikante Änderung der Impedanzwerte. Die Reizschwellenwerte hingegen zeigten einen Anstieg ($0,95 \pm 0,41$ V vs. $1,15 \pm 0,94$ V; $p = 0,041$), die R-Welle reduzierte sich von $11,6 \pm 6,2$ mV auf $9,0 \pm 5,2$ mV ($p < 0,005$). Ventrikuläres Undersensing wurde in keiner der dokumentierten anhaltenden und nicht anhaltenden Tachykardien beobachtet.

Schlußfolgerung In unserem Kollektiv konnte gezeigt werden, daß die ICD-Therapie bei Patienten mit ARVC kein erhöhtes Risiko für Fehlwahrnehmung ventrikulärer Ereignisse birgt, obwohl eine signifikante Änderung der ventrikulären Reizschwelle und des Sensings im Langzeitverlauf nachgewiesen werden konnte.

XIV-3

029

Lower Body Mass Index and Atrial Fibrillation Are Independent Predictors for Mortality in Patients with an Implantable Cardioverter Defibrillator

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Background ICD recipients are a sick population with a number of comorbidities. The purpose of this study was to evaluate various risk factors with respect to total mortality in an unselected ICD population.

Methods Survival analysis comprised a total of 77 consecutive patients (pts) (63 m; age 66 ± 11 yrs.). ICD therapy was indicated for secondary prevention in 74 pts and for primary prevention in 3 pts. A SC-ICD was implanted in 43 pts, a DC-ICD in 29 pts and CRT-D in 5 pts. Ischaemic CM was present in 50 pts, non-ischaemic CM in 17 pts and electrical disease in 10 pts. Comorbidities were diabetes ($n = 11$), renal disease ($n = 10$), obstructive lung disease ($n = 13$) and hypertension ($n = 42$).

Results Mean EF was 34 ± 13 %, mean QRS duration 129 ± 34 ms and mean body mass index (BMI) 26 ± 4 kg/m². Two thirds of pts were in NYHA functional class I ($n = 15$) or II ($n = 35$), one third of pts in class III ($n = 22$) or IV ($n = 5$). AF was present in 32 (41 %) pts,

23 pts with paroxysmal and 9 pts with permanent AF. Antiarrhythmic medication included betablockers (31 %), amiodarone (13 %), both drugs (44 %), and 12 % of pts received no drugs. During the study period 11/77 (14 %) of the pts died. Mean follow-up time was 27 ± 17 months for the living and 13 ± 14 months for the dead. Kaplan-Meier estimates of the 1, 2, 3, 4 year cumulative probability of survival were 90 %, 86 %, 82 % and 77 %, respectively, and the estimate of mean survival time was 51.5 months. Assuming a proportional hazard model, Cox Regression analysis found significant hazard ratios for QRS duration ≥ 120 ms (HR 3.74), NYHA $\geq$ III (3.11), presence of paroxysmal (HR 4.83) or permanent AF (HR 7.99), and BMI ≤ 26 kg/m² (HR 4.93). Pts receiving shocks showed a trend toward higher mortality, whereas all other covariates (gender, myocardial infarction, coronary intervention, medication, diabetes, other comorbidities) did not seem to have an influence on survival.

Conclusion Presence of AF and of a lower BMI has a significant impact on survival of pts with ICDs. Both findings may be indicative of end stage heart failure or diseases associated with high sympathetic activation. Besides, QRS duration and NYHA functional class are valuable predictors for outcome.

XIV-4

059

Mortalität und Morbidität bei ICD-Patienten mit dilatativer Kardiomyopathie: Stellenwert nichtinvasiver Parameter in der Risikostratifizierung

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Hintergrund Patienten mit chronischer Herzinsuffizienz haben ein signifikant erhöhtes Risiko, an plötzlichem Herztod (SCD) zu versterben. Die primärprophylaktische ICD-Implantation ist bei Pa-

tienten mit ischämischer Kardiomyopathie und einer LVEF ≤ 35 % mittlerweile eine etablierte Therapie. Aufgrund widersprüchlicher Studienergebnisse sind jedoch bei Patienten mit dilatativer Kardiomyopathie (DCM) zusätzliche Kriterien der Risikostratifizierung bezüglich des SCD gefordert, aber noch nicht etabliert. Wir analysierten ein vergleichbares Kollektiv von DCM-Patienten mit einer sekundärprophylaktischen ICD-Indikation, um daraus mögliche prädiktive Parameter für die Primärprophylaxe ableiten zu können.

Patienten und Methodik Unter den 385 konsekutiven ICD-Patienten der Medizinischen Universitätsklinik Graz von 2/1997 bis 9/2005 befanden sich 42 Patienten (11 %; 34 m, 8 w; Alter 58 ± 11 Jahre, Range 25–80) mit DCM und einer LVEF ≤ 35 %, denen ein ICD als Sekundärprophylaxe (nach Kammerflimmern bei 16, nach einer Kammertachykardie bei 26 Patienten) implantiert wurde (25 Einkammer-ICDs, 8 Zweikammer-ICDs, 9 CRT-D). Die LVEF betrug zum Zeitpunkt der Implantation 24 ± 5 %, die QRS-Breite 130 ± 33 ms. 23 Patienten (55 %) hatten einen Linksschenkelblock (LSB).

Resultate In einem medianen Follow-up-Zeitraum von 46 Monaten (Range 1–109) verstarben 12 Patienten (29 %). 3 Patienten wurden herztransplantiert. Mittels Kaplan-Meier-Analyse wurde eine kumulative Überlebensrate von 90 %, 81 %, 69 % und 65 % nach 1, 2, 3 bzw. 4 Jahren errechnet. Bei Patienten mit einer LVEF ≤ 25 % ($p = 0,032$), einer QRS-Breite ≥ 120 ms ($p = 0,040$) oder mit einem LSB ($p = 0,017$) zeigte sich eine signifikant kürzere Überlebensdauer. 33 Patienten (79 %) erhielten zumindest eine ICD-Therapie infolge einer ventrikulären Tachyarrhythmie, 19 (45 %) aufgrund von Kammerflimmern. Die erste ICD-Therapie ereignete sich im Median nach 6,5 Monaten (Range 1–27). In einer univariaten Analyse waren eine LVEF ≤ 20 % ($p = 0,021$) sowie das Vorhandensein eines LSB ($p = 0,027$) mit einer signifikant kürzeren Zeitdauer von der ICD-Implantation bis zur ersten malignen Tachyarrhythmie mit konsekutiver ICD-Therapie assoziiert. Für andere Kovariaten (Alter, Geschlecht, NYHA-Klasse, Diabetes, Grundrhythmus, medikamentöse Therapie) zeigte sich kein Einfluß auf Mortalität oder Morbidität.

Zusammenfassung Bei Patienten mit DCM und sekundärprophylaktischer ICD-Implantation sind eine LVEF $\leq 25\%$, eine QRS-Breite ≥ 120 ms und das Vorhandensein eines LSB jeweils mit einer signifikant erhöhten Mortalität assoziiert. Sowohl eine LVEF $\leq 20\%$ als auch ein LSB sind prädiktive Parameter für das frühe Wiederauftreten maligner Tachyarrhythmien mit konsekutiver ICD-Therapie. Ob diese nichtinvasiven Parameter auch für die Risikostratifizierung bei der DCM hinsichtlich einer primärprophylaktischen ICD-Implantation geeignet sind, ist Gegenstand laufender Untersuchungen.

XIV-5

090

Incidence of Left Bundle Branch Block in Patients with ICD Stratified According to Left Ventricular Function and Symptoms

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Background According to the ESC guidelines a device with a biventricular pacing function should be considered in patients, who receive an ICD, who have a symptomatic left ventricular systolic dysfunction, and who have a left bundle branch block (LBBB). We analysed the incidence of a LBBB in patients with ICD stratified according to left ventricular function and symptoms as soon as their outcome.

Methods The medical records of patients who received an ICD between April 1998 and July 2005 were reviewed and outcome was followed-up until February 2006. Patients with a left ventricular ejection fraction $\geq 40\%$ were defined as patients with preserved left ventricular function (LVF). Patients who had a reduced LVF and described symptoms of heart failure before or after implantation of an ICD were defined to have symptomatic left ventricular dysfunction (LVD).

Results Out of 525 patients with an ICD 142 patients had a preserved LVF, 111 patients had an asymptomatic LVD and 272 patients had a symptomatic LVD. The incidence of a left bundle branch block was 8 % in patients with preserved LVF, 22 % in patients with asymptomatic LVD, and 27 % in patients with symptomatic LVD. 24 patients with symptomatic LVD were initially treated with a ICD/CRT device. Mortality rate was 10 % in patients with preserved LVF mortality rate, 30 % in patients with asymptomatic LVD, and 48 % in patients with symptomatic LVD ($p < 0.0001$). In patients with symptomatic LVD mortality rate was 67 % in patients with LBBB and 40 % in those without ($p < 0.0001$). Patients with CRT therapy were excluded from analysis of mortality rate (12 %).

Conclusion In our patients who had received an ICD, the mortality rate was significantly different between patients with symptomatic and asymptomatic LVD with and without LBBB. In these patients with symptomatic LVD and LBBB, who are still alive, the implantation of a device with a biventricular pacing function should be performed.

XIV-6

012

Vektor-EKG als Prädiktor einer akuten hämodynamischen Verbesserung der kardialen Resynchronisationstherapie (CRT)

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Einleitung Die kardiale Resynchronisationstherapie (CRT) stellt eine potentiell effektive nichtpharmakologische Maßnahme in der Therapie von Patienten mit schwerer Herzinsuffizienz und entsprechender ventrikulärer Leitungsstörung dar. Die wichtige Identifizierung von Respondern der invasiven und kostenintensiven CRT auf Basis des Ruhe-EKGs ist umstritten und die echokardiographische Beurteilung uneinheitlich. Die Etablierung einer weiteren nichtinvasiven Methode zur sicheren Prädiktion der Responder einer CRT erscheint daher unbedingt erforderlich.

Method 70 Patienten (Alter: 61,5 Jahre; 50 m; QRS-Breite $158 \pm 20,9$ ms, EF 22,5 %, LVEDD 72,2 mm) wurden mit einem CRT-System versorgt. Die Patienten wurden einerseits aufgrund einer (nach der CRT-Implantation) intrakardial durchgeführten hämodynamischen Untersuchung (Referenzmethode, „Goldstandard“) und andererseits aufgrund eines Vektor-EKG-Algorithmus in Responder (R1 und R2) und Non-Responder (NR) der CRT klassifiziert. Die hämodynamische Messung erfolgte über einen im linken Ventrikel platzierten Pigtail-Katheter (Kontraktilität, dp/dt) und einen in der A. femoralis liegenden Katheter (Blutdruckamplitude, pulse pressure, PP). Die hämodynamischen Parameter dp/dt und PP wurden ohne („CRT-off“, Basis) und mit biventrikulärer Stimulation („CRT-on“) gemessen (jeweils gemittelt über 10 Schläge). Die optimale AV-Zeit und das optimale VV-Intervall wurden in 20-ms-Schritten ebenfalls invasiv ermittelt. Aufgrund der hämodynamischen Veränderungen unter „CRT-on“ gegenüber „CRT-off“ wurden die Patienten in sehr gute Responder (R1: dp/dt $> 20\%$, PP $> 10\%$), gute Responder (R2: dp/dt 10–20 %, PP 5–10 %) und Non-Responder (NR: dp/dt $< 10\%$, PP $< 5\%$) klassifiziert. Das Vektor-EKG wurde unter Basisbedingung („CRT-off“) registriert (SEMA 200, Schiller, CH). Ein Vektor-EKG-Algorithmus wurde entwickelt, aufgrund dessen die Patienten ebenfalls in R1, R2 und NR klassifiziert wurden. Die Klassifizierung der Patienten nach dem Vektor-EKG erfolgte in geblinder Form – ohne klinische Daten und unabhängig von der hämodynamischen Untersuchung.

Ergebnisse Nach der Hämodynamik (Referenzmethode für eine akute Verbesserung) wurden 60 Patienten als Responder (R1 oder R2) und 10 Patienten als Non-Responder (NR) klassifiziert. Die Vektor-EKG-Analyse war bei allen 70 Patienten durchführbar. Die Klassifizierung der Patienten nach dem Vektor-EKG ergab eine gute Übereinstimmung (betreffend R1, R2 oder NR) bei 59 von 70 Patienten (84,3 %) mit der Klassifizierung nach der invasiv erhobenen Hämodynamik. Neun der 10 mittels hämodynamischer Messung als Non-Responder klassifizierten Patienten wurden mit dem Vektor-EKG-Algorithmus korrekt als Non-Responder identifiziert.

Zusammenfassung Ein nichtinvasiv und sehr einfach zu erhebender Vektor-EKG-Algorithmus ermöglicht die Prädiktion von potentiellen hämodynamischen Respondern einer kostenintensiven CRT mit hoher Wahrscheinlichkeit. Insbesondere die Non-Responder konnten mit dem Vektor-EKG-Algorithmus sehr gut identifiziert werden. Untersuchungen an größeren Patientenkollektiven könnten dem Vektor-EKG einen fixen Stellenwert in der Patientenselektion und kardialen Resynchronisationstherapie verschaffen.

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002

Clinical Benefit of Implantable Cardioverter Defibrillators in Patients with Brugada Syndrome

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Background Brugada syndrome is associated with a high incidence of sudden cardiac death caused by ventricular fibrillation. Thus, implantable cardioverter defibrillators (ICD) became an important therapeutic option in patients with Brugada syndrome.

Objective We aimed to investigate the clinical benefit after ICD implantation in patients with Brugada syndrome.

Patients In our institution, we have seen a total of 2700 patients during the last two decades. In this population, 12 patients (0,44 % of patient population; 8 male, 4 female) had Brugada syndrome, which was diagnosed by the characteristic ECG-pattern either at rest (8 patients) or after pharmacological testing with Ajmalin (4 patients). Syncope was observed in 2 patients, whereas another 2 patients were sudden death survivors; the remaining 8 patients were asymptomatic.

Results ICDs were implanted in 11 patients. One completely asymptomatic patient got no ICD because no tachyarrhythmia was inducible in the programmed electrophysiological study. Mean follow-up period was 55.7 ± 29.3 months after implantation. Only one patient (8,2 %) needed defibrillation therapy (overall 7 successful shocks during two episodes of electrical storm). Two patients re-

ceived only inappropriate shocks (because of T-wave oversensing or tachycardia due to atrial fibrillation).

Conclusion Patients with Brugada syndrome benefit from ICD implantation, but less frequently than previously anticipated. The problem of inappropriate ICD-discharges is still of major concern.

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105

Geschlechtsspezifische Unterschiede in der Schrittmachertherapie in einem kardiologischen Schwerpunkt Krankenhaus

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Einleitung Gesamtösterreichische Daten zeigen, daß Frauen in der Schrittmachertherapie in bezug auf Systemauswahl und physiologische Stimulationsformen benachteiligt werden. Wir analysierten, ob dies auch auf ein kardiologisches Schwerpunkt Krankenhaus zutrifft, in dem bevorzugt physiologische Systeme (AAI, DDD, VDD), die den Vorhof in die Stimulation und/oder Wahrnehmung einbeziehen, implantiert werden.

Patienten und Methode Zwischen 1985 und 2005 wurde an unserer Abteilung bei insgesamt 2338 Patienten (Durchschnittsalter 76 ± 10 a; 48 % weiblich) ein Schrittmacher (SM) implantiert. Dabei wurde vorzugsweise – bei Vorliegen einer Leitungsstörung auf nur einer Ebene zum Zeitpunkt der Implantation – bei Patienten mit Sick-Sinus-Syndrom (SSS) ein AAI-SM, bei Patienten mit AV-Block ein VDD-SM eingebaut. Die Auswertung der Daten erfolgte hinsichtlich geschlechtsspezifischer Unterschiede der einzelnen Stimulationsformen (AAI, DDD, VDD, VVI) bei den zwei Hauptindikationen AV-Block und SSS. Bedingt durch den Einsatz von VDD-Systemen erst ab 1995 bezieht sich die Datenanalyse beim AV-Block lediglich auf die letzten zehn Jahre.

Ergebnisse Frauen erhielten bei der Indikation SSS signifikant häufiger einen SM und signifikant häufiger ein physiologisches System als Männer, obwohl sie zum Zeitpunkt der Erstimplantation um durchschnittlich vier Jahre älter waren (78 vs. 74). Bei AV-Block-Patienten bestand ein ausgewogenes Verhältnis hinsichtlich Indikation und physiologischer Stimulation bei einem Altersunterschied von fünf Jahren bei Implantation (80 vs. 75), wobei bei Frauen signifikant häufiger ein VDD-SM eingebaut wurde (**Tabelle 8**).

Zusammenfassung Im Gegensatz zu den gesamtösterreichischen Daten werden Frauen in einem kardiologischen Schwerpunkt Krankenhaus in der Auswahl eines physiologischen Schrittmachersystems (AAI, DDD, VDD) nicht benachteiligt. Bei der Indikation SSS erhalten sie trotz eines deutlich höheren Lebensalters bei Erstimplantation sogar signifikant häufiger ein physiologisches DDD- und vor allem AAI-System als Männer. Beim AV-Block wird bei Frauen signifikant häufiger ein VDD-System implantiert. Dies weist darauf hin, daß Frauen bei Erstimplantation zwar älter, jedoch „gesünder“ – mit einem Leitungsproblem auf nur einer Ebene (Sinusknoten oder AV-Knoten) – sind.

Tabelle 8: B. Fellner et al.

Zeitpunkt der Erstimplantation	1985 (1995) – 2005	
	Frauen	Männer
PM-Indikation AV-Block	n = 571	
Anteil in %	50	50
VVI (in %)	59	41
DDD (in %)	43*	57
VDD (in %)	52*	48
PM-Indikation SSS	n = 669	
Anteil in %	57	43
VVI (in %)	43*	57
AAI (in %)	77**	23
DDD (in %)	52*	48

*p < 0,05; **p < 0,001

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