Abstracts of the Scientific Autumn Congress of the Netherlands Society of Cardiology 2016

De abstracts zijn ook digitaal beschikbaar via www.cardiologie.nl/nhj

3 and 4 November 2016, Papendal, Arnhem
Dear reader,

We are pleased to present here the abstracts of the Scientific Autumn Meeting of the Netherlands Society of Cardiology which will be held on 3 and 4 November 2016 in Papendal, Arnhem.

We hope that you will enjoy reading the abstracts.

On behalf of the Chief Editorial Board
Prof. Dr. E.E. van der Wall
SESSION I CARDIOVASCULAR IMAGING

NORMATIVE VALUES MEASURED WITH 3D AND 2D ECHOCARDIOGRAPHY IN A HEALTHY DUTCH POPULATION

P.W.T. van Grootel; A.E. van den Bosch; M.E. Menting; J.S. McGhie; J.W. Ruijssenaars
(Erasmus Medical Center, Rotterdam)

ruijssenaars@erasmusmc.nl

ABSTRACT

Purpose: To obtain 1) echocardiographic chamber measurements in healthy volunteers aged 20 to 72 years to propose normative values and 2) determine influences of anthropomorphic factors on these measurements.

Methods: A cohort of 155 prospectively recruited healthy subjects, aged 20-72 years (at least 28 subjects per age decade, equally distributed for sex) underwent physical examination and 2D and 3D echocardiography. Both ventricles and atria were assessed and volumes were calculated.

Results: 147 subjects were included (age 44±14 years, 50% female). Feasibility for 3D values were 82.3% and 66.0% for LV and RV respectively. Values found with 2D and 3D were consistently higher than current guidelines recommend (see figures). 3D volumes were higher than 2D volumes. Gender dependency was seen in all BSA corrected volumes, but age had little influence on volumes or ejection fractions. Blood pressure was an independent predictor for RV volumes, even after correction for gender and age.

Conclusion: This study provides 2D and 3D echocardiographic reference ranges for both the LV and RV, based on a healthy Dutch population measured with Tomtec. BSA indexed volumes remain gender-dependent, age did not influence ventricular volumes and a rise in blood pressure was independently associated increased RV volumes, suggesting that adequate blood pressure management could have protective qualities. The higher volumes found may be indicative for the Dutch people used in this study.

Keywords: 3D echocardiography; normal values; reference values

FIRST-PASS ADENOSINE MR IMPROVES PRE-TEST LIKELIHOOD IN 641 PATIENTS WITH STABLE CHEST PAIN

D. Rijlaarsdam-Harmanci; D. Kuijper; P.R.M. van Dijikman; R.T. van Domburg; J.W. Scholten (Erasmus Medical Center, Rotterdam)
dorinini@sarsdam@gmail.com

ABSTRACT

Purpose: The diagnostic yield of conventional coronary angiography (CCA) is low. Two-thirds of diagnostic CCA in patients with stable chest pain are not followed by a revascularisation. The purpose of this study is to assess whether coronary artery calcium scoring (CACS) followed by first-pass adenosine MR is able to improve the diagnostic yield of CCA.

Methods: From December 2004 to May 2011 consecutive new patients with stable chest pain and CACS >0 referred for first-pass adenosine MR were enrolled. Pre-test likelihood was assessed according to the ACC/ AHA guidelines on exercise testing. Pre-test probability scores were compared with ROC analysis. Patients with a perfusion defect were examined by CCA. Outcome was obstructive CAD defined as ≥70% diameter stenosis in ≥1 vessel on CCA.

Results: In total, 641 patients were included (mean age 61.7 year, 50% men) of whom 12.8% had low, 72.0% intermediate and 15.1% high pre-test likelihood of CAD. Ischemia was present on adenosine MR in 13.6%. Of the patients with high pre-test likelihood 64.9% showed no ischemia, whereas of the patients with low pre-test likelihood 3.6% showed ischemia. In most patients (90.5%) whom an ischemic first-pass adenosine MR was performed, a positive diagnostic CCA was found. CACS and first-pass adenosine MR in addition to pretest likelihood improves the diagnostic yield of CCA to 90.5% (c-index improved from 0.64 to 0.70; p<0.01).

Conclusion: ACCs combined with first-pass adenosine MR provide important incremental value over pre-test likelihood, and increases the diagnostic yield of CCA to 90.5%.

Keywords: coronary angiography; adenosine MR; calcium score
SESSION I  CARDIOVASCULAR IMAGING (continued)

CARDIAC INVOLVEMENT IN ANKYLOSING Spondylitis: INSIGHTS FROM CARDIOVASCULAR MAGNETIC RESONANCE IMAGING

P.S. Biesbroek; S.C. Heslinga; T.C. Konings; I.E. van der Horst-Bruinsma; M.B.M. Hofman; F.M. van der Ven; G. Kamp; V.P. van Halm; M.L.J. Pelto; Y.M. Smidt; A.C. van Rietbergen; M.T. Muntendam; R. Nijpoldt (VU Medical Center, Amsterdam)
p.biesbroek@vumc.nl

ABSTRACT
Purpose: To determine the presence and extent of cardiac involvement in patients with ankylosing spondylitis (AS) using cardiovascular magnetic resonance (CMR).

Methods: Patients with AS were screened by transfemoral echocardiography (TEE) for study participation. Fifteen consecutive AS patients with an abnormal TTE, including cardiac abnormalities, valvular disease, or aortic root dilation, were prospectively included. CMR protocol included cine imaging for left ventricular (LV) function, late gadolinium enhancement (LGE) for focal fibrosis, and T1 mapping for quantification of the extracellular volume (ECV) (e.g. marker of diffuse interstitial fibrosis). LV dysfunction was defined as a LV ejection fraction (LVEF) ≤50%.

Results: Sixteen patients were screened by TTE when the predefined number of 15 participants was reached, of which one was excluded. In the 14 included AS patients a complete CMR exam (mean age 62 years, 89% male, and mean disease duration 21 years), LV diastolic dysfunction was the most common finding on TTE (69%), followed by aortic root dilation (19%), right ventricular (RV) dilation (6%), and RV dysfunction (6%). CMR revealed focal hyperenhancement in three patients (21%, all with a particular pattern of enhancement (Figure 1)), LGE was present in five patients (36%), and was significantly lower in patients with hyperenhancement (47 ± 8% versus 56 ± 5%, p=0.03). Myocardial ECV was strongly correlated with CMR concentration (Pearson’s correlation = 0.83, p<0.01) and LVEF level (Spearmann’s rank correlation = 0.69, p=0.01).

Conclusions: The findings of this first CMR study in AS suggest the presence of cardiac involvement. CMR with cines imaging and LGE identified global LV dysfunction and focal areas of hyperenhancement, while T1 mapping with ECV quantification consent discriminated patients with various degrees of disease activity.

Keywords: Ankylosing Spondylitis; Cardiovascular Magnetic Resonance; Cardiac Involvement; Late Gadolinium Enhancement; T1 Mapping

Figure 1 - Hyperenhancement was found on the late gadolinium enhancement images in three patients. All three had a particular pattern of enhancement, with minimal to subepicardial hyperenhancement, localized in the basal inferior and inferolateral LV walls (arrows). A 67-year old male, diagnosed with ankylosing spondylitis (AS) since 24 years (Figure 1A) and with AS diagnosis and ECV determination in 2015 (Figure 1B). A 74-year old male, diagnosed with AS since 19 years (Figure 1C) and with AS diagnosis and ECV determination in 2016 (Figure 1D). A 55-year old male, diagnosed with AS since 47 years (Figure 1E).

THE AGATSTON SCORE OF THE DESCENDING AORTA IS AN INDEPENDENT PREDICTOR OF CORONARY ARTERY DISEASE ON TOP OF CORONARY AGATSTON SCORE IN A LOW-RISK POPULATION

E.A.-P. Duden; F.E.C.M. Peeters; S. Altintas; L.I.B. Heckman; R.Haest; J.A. Klaagren; A.L. van der Velden; B.J.H. Katselela; W. Vooij; H.G.M. Clijn (Maastricht University Medical Center, Maastricht)
edton.duden@mumc.nl

ABSTRACT
Purpose: We assessed the ability of the Agatston score of the descending aorta in a coronary artery calcium scan (CAG) to predict future significant coronary artery disease (CAD) in a low-risk population.

Methods: 300 patients, referred for cardiac CT as work-up for pulmonary vein isolation (n=90) or cardiac screening (n=210), were included. All were free of cardiovascular disease at baseline. Two observers determined the Agatston score of the aorta between the end of the aortic arch and the diaphragm on standard CCA images.

Results: 13 patients (1.4%) developed CAD (ACS n=4, PCI/CABG n=9), significant CAD on CAG (n=8) during follow-up of 67±13 years. Baseline characteristics of patients who developed CAD were equal to those of patients who did not, except for age (61±6.8 vs 55±2.1±10.1 years, p=0.02). The Agatston score of both the coronary arteries and the descending aorta was higher in patients who developed CAD (range 0.2±255 [median 0] vs 0.7±61.5 median 0); 0.5±875 [median 0] vs 0.0±1241 [median 0]). Age adjusted Cox-regression showed that both the coronary Agatston score (HR per 100 units 1.37 [1.17–1.60; p=0.001) and the descending aortic Agatston score (HR per 100 units 1.05 [1.01–1.09; p=0.01) were predictors of future CAD. AS patients had no coronary calcification but did show aortic calcification, which was associated with a high incidence of CAD (67%).

Conclusion: Freely available information on calcification of the descending aorta should be included in the standard analysis of CCA since it predicts future CAD in a low-risk population.

Keywords: coronary CT; aorta calcification; prognosis

COMPREHENSIVE CARDIAC CT VERSUS FUNCTIONAL TESTING IN SUSPECTED CORONARY ARTERY DISEASE: THE MULTICENTRE, RANDOMIZED CRESCENT II TRIAL

M.M. Lubbers; A. Coenen; M. Kofflard; M. van Gent; E.J. van den Bos; L van Asselten; B. Kooij; T. Gaalena; P. Mullers; T. Bluning; A. Nezian; B. Kietelenaer; M. Das; S. Altintas; A. Meurer; M. Hanink; K. Neeman (Erasmus Medical Center, Rotterdam)
m.m.lubbers@erasmusmc.nl

ABSTRACT
Purpose: Cardiac CT has the potential to improve the diagnostic workup of patients with angina pectoris. Adding myocardial CT perfusion imaging to cardiac CT provides an opportunity for combined evaluation of coronary anatomy and functional significance of coronary stenosis and can be an important gatekeeper for invasive angiography. In this randomized trial we assessed the effectiveness, efficiency and safety of a tiered cardiac CT protocol in comparison to functional testing.

Methods: Between July 2013 and November 2015 266 patients with stable angina, were prospectively randomized between cardiac CT and functional testing. The tiered cardiac CT protocol included a cardiaccinematic, followed by CT-angiography if the Agatston calcium score was ≥0. Patients with a significant stenosis on CT-angiography continued to CT perfusion imaging.

Results: By six months, the rate of negative invasive coronary angiograms, was lower for the cardiac CT group. In comparison to the functional testing group (24% vs. 7%; p=0.002) and the number of performed invasive angiograms with a class I revascularization indication, was 68% after CT, compared to 50% in the functionaltesting group (p=0.017). The median duration until the final diagnosis was 0 (0;0) days by CT and 0 (0;17) by functional-testing (p=0.002). Overall, 1% of patients randomized to CT underwent another test after the baseline test, compared to 37% in the functional-testing group (p=0.002). Invasive angiography was similarly frequent after CT and functional testing (13% vs 14% p=0.860). The observed MACE rate was comparable (3% vs 3%, p=1.000).

Conclusion: For patients with suspected stable CAD, a tiered cardiac CT protocol offers an effective and safe alternative to functional testing.

Keywords: clinical trials; stable angina; diagnostic testing; CT calcium scan; coronary CT-angiography; CT myocardial perfusion imaging; functional testing

Figure 1 - Dosemetric testing. Proportion of patients requiring further non-invasive and/or invasive testing after cardiac CT and a baseline functional test.

COGNITION AND STRUCTURAL BRAIN DAMAGE IN ADULTS WITH TETRALOGY OF FALLOT

M.A. Sluman; E. Richard; L. van Wameno; J.W. van Dalen; B.J.M. Bouma; M. Groenink; C.E.M. Magie; B.A. Schram; B.J.M. Mulder (Academic Medical Center Amsterdam, Amsterdam)
m.a.sluman@amc.uva.nl

ABSTRACT
Purpose: Tetralogy of Fallot (TOF) is associated with unemployment and lower educational levels. This could be caused by brain damage through previous cyanosis, prenatal cerebral impairments or peripartum damage. The aim of this study is to investigate the presence of brain damage in adults with TOF and to investigate relations with occupational outcomes.

Methods and results: In a single centre cohort study, brain damage and its possible relevance was studied in 67 TOF patients through magnetic resonance imaging (MRI) of the brain, a neuropsychological examination (NPE) and a questionnaire on work experiences. Median age was 37 years (range 20 – 63) and gender distribution was equal. Cerebral infarctions were seen in 12 (19%) patients. While moderate hypertensities (WMH) were seen in 35 patients (55%) and not related to age. In patients aged younger than 40 years (n=37), infarctions were seen in 4 (11%) and WMH in 12 patients (32%). Twenty-one participants (32%) showed signs of cognitive impairment in at least one domain of NPE. No relation was found between MRI findings and NPE. Fifty two patients (78%) were employed, working 4 days per week (± 1) and 31 hours per week (range 4 – 40) on average. Nineteen (37%) experienced job related problems attributed to their cardiac condition. No relation was found between unemployment or other job related problems and signs of cerebral damage (infarction, WMH, impaired NPE). Likewise, no association was found between clinical parameters (age at surgery, number of surgeries, previous shunt) and signs of cerebral damage.

Conclusion: Many adults with TOF show signs of cerebral damage at MRI or NPE at relatively young age. However, cerebral damage did not seem to influence job participation at adult age. Other factors for unemployment need further investigation.

Keywords: Tetralogy of Fallot; cognitive impairment; brain damage
SESSION II DEVICES/CRT

A NOVEL IMPLANTATION STRATEGY IN PACEMAKER DEVICE INFECTION IN PACEMAKER DEPENDENT PATIENTS
F.S. van den Brink; V.F. van Dijk; J. Geijsbeek; E. Daanert; U. Sonker; P. Kleijn; J. Balt
(Sint Antonius Hospital, Nieuwegein)
F.van.den.brink@antoniusziekenhuis.nl

ABSTRACT
Purpose:
Treatment of pacemaker (PM) device infections is challenging in pacemaker dependent patients. We propose a novel implantation strategy for this group of patients
Methods:
Patients who were PM dependent and were admitted with a PM infection received a combined procedure of LV epicardial implantation of a PM lead and subsequent extraction of the infected system. No temporary pacing wire was used and the PM generator was placed in the left flank.
Results:
Between 2012 and 2015 we treated 36 patients who were PM dependent with a PM infection. The majority of patients was male (81% (13/16)). The mean age was 71 years (50-91). The cause of infection was vascular endocarditis in 36% (6/16), lead infection in 25% (6/16) and isolated pocket infection in 38% (6/16).
All patients underwent epicardial implantation of a LV lead (Medtronic Epicard 1084T bipolar lead) and extraction of the infected device. There was no peri-procedural mortality and no post-procedural tamponades occurred. There was one complication in the form of a haemorrhage at the infected device extraction site. In the mean follow up period of 18 months there were 4/16 deaths, none of which were attributable to epicardial LV implantation. LV lead thresholds were 1.07mv (0.25-2.8mV) upon the form of a haemorrhage at the infected device extraction site. In the mean follow up period of 18 months there were 4/16 deaths, none of which were attributable to epicardial LV implantation. LV lead thresholds were 1.07mv (0.25-2.8mV) upon implantation which increased to 1.18mv (0.4-2.75mV) at the last recorded LV threshold measurement. There were no re-infections of the epicardial lead or device.
Conclusion:
Epicardial LV pacemaker implantation and subsequent extraction of an infected pacemaker in pacemaker dependent patients is feasible and safe with good long-term outcome.
Keywords:
pacemaker; infection; implantation

IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS AND OLDER PEOPLE: THE DUTCH CLINICAL PRACTICE
D. Vlimar; J.W. Blom; M. Muller; M.J. Scholij; L. van Erven (Leiden University Medical Center, Leiden)
d.johnn@humlez.nl

ABSTRACT
Purpose:
Benefit and burden of implantable cardioverter-defibrillator (ICD) therapy is more debatable in older people, compared to younger patients, especially when primary prevention is concerned. It is estimated that 20% of the annual ±5000 ICD procedures concern patients ≥ 75 years of age. We aimed to evaluate the current practice ICD implants and pulse generator change in the Netherlands.
Methods:
Representatives from all Dutch ICD implanting centres were interviewed. Questions aimed to evaluate: outpatient care, pre-operative patient education on end-of-life-care issues, social cognitive evaluation of patients, clinical evaluation of all patients prior to ICD replacement and the management for the option to downgrade or not replace a device.
Results:
The response rate was 86%. Management appeared diverse amongst hospitals. Although physicians consistently reported to perceive age ≥80 years as an incentive for more elaborate patient evaluation and to have had cases in which devices were downgraded or not replaced, end-of-life-care discussions were not part of standard pre-procedure consultation in 64%. Patients were invited at the outpatient clinic prior to elective device replacements at 49% of the centres. At 17% of the centres, replacements as indicated during technical follow up were performed after administrative clinical evaluations. Separate social-cognitive evaluation was solely based on clinical impression at 85% or not performed at 8%.
Conclusion:
An increasing proportion of ICD patients are of high age. Management is diverse and a structured framework for the care and evaluation of such patients is however absent in most hospitals.
Keywords:
implantable cardiac defibrillators; cardio geriatrics; octogenarians

RATIONAL AND DESIGN OF DUTCH OUTCOME IN ICD THERAPY (DO-IT) REGISTRY
M. Hulleman; M. van Barneveld; N. Bruinsma; M.G.W. Djikgraaf; A.E. Zwierdenma;
A.M.M. Wilde (Academic Medical Center Amsterdam on behalf of the DO-IT investigators)
m.j.debo@gmail.com

ABSTRACT
Purpose:
Indication for implantable cardioverter defibrillator (ICD) therapy for primary prevention of sudden cardiac death (SCD) in heart failure patients is based on left ventricular ejection fraction (LVEF) and New York Heart Association (NYHA) class. There is ongoing debate whether LVEF and NYHA class are accurate selection criteria, as the majority of patients never receive therapy. The risk of SCD might be stratified by clinical risk factors. We aimed to register ICDs for primary prevention in heart failure patients to identify subgroups with different risk of SCD and to assess the cost-effectiveness of ICDs.
Methods:
DO-IT included approximately 1500 consecutive patients in all 28 ICD implanting centres in the Netherlands. The inclusion criteria were based on the Class I indications for ICD implantation in patients from AHA/ESC Guidelines. The primary outcomes are ICD therapy and survival during at least two years of follow-up. We will develop prediction rules relating baseline characteristics to death or appropriate shock over ICD therapy and survival during at least two years of follow-up. We will develop structured framework for the care and evaluation of such patients is however absent in most hospitals.
Results:
The DO-IT Registry is a large nationwide cohort of patients receiving ICDs for primary prevention of SCD, suitable to identify subgroups of patients who might benefit more or less from ICD implantation.
Keywords:
Implantable Cardioverter Defibrillator; primary prevention; multicenter registry

INCREASED AUTOMATED EXTERNAL DEFIBRILLATOR USE AND SURVIVAL OF OUT-OF-HOSPITAL CARDIAC ARREST IN THE NIMEGEN AREA
J. Nag; J. Hermann; J.L. Bonne; J. Thannhauser; K. van der Wal; P.M. van Grunsven;
K. Boer; M.A. Broeke (Radboud University Medical Center, Nijmegen)
J.nais@radboudumc.nl

Purpose:
Out-of-hospital cardiac arrests (OHCA) are a major healthcare problem with relatively low survival rates. To improve outcome, in the region of Nijmegen extensive initiatives have been undertaken to train civilian volunteers in resuscitation and automated external defibrillator (AED) use. In this light, we compared AED use and outcome after OHCA over the past years.
Methods:
We studied two cohorts of consecutive patients with an OHCA, one with patients transported to the Radboudumc between 2008-2011, the other in the period 2013-2015. We compared AED use in cases not witnessed by the Emergency Medical Service and the following outcome measures: any return of spontaneous circulation in the field (ROSC) and survival to discharge.
Results:
In total, 417 patients were studied: 192 resuscitated between 2008-2011 and 225 between 2013-2015. In the latter period, the AED was attached more often (44% vs. 2013-2015: 57%, p=0.01). Survival only increased in patients with shockable first-observed rhythm (2008-2011: 42% vs. 2013-2015: 57%, p=0.01).
Conclusion:
Survival to discharge of OHCA patients transported to the Radboudumc has increased from 34% in 2008-2011 to 44% in 2013-2015, which is mainly driven by better outcomes in case of a shockable first-observed rhythm. The twofold increase in the use of AEDs seems the primary contributor to these improved outcomes.
Keywords:
out-of-hospital cardiac arrest; survival; automated external defibrillator

Table 1. Baseline characteristics and outcomes for the cohorts 2008-2011 and 2013-2015.

<table>
<thead>
<tr>
<th>Variable</th>
<th>2008-2011</th>
<th>2013-2015</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>n = 192</td>
<td>n = 225</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>138 (72)</td>
<td>158 (70)</td>
<td>0.711</td>
</tr>
<tr>
<td>Age (years)</td>
<td>60 (50-73)</td>
<td>63 (53-74)</td>
<td>0.276</td>
</tr>
<tr>
<td>Anatomical location</td>
<td>81 (42)</td>
<td>94 (42)</td>
<td>0.102</td>
</tr>
<tr>
<td>Bystander witnessed</td>
<td>129 (67)</td>
<td>147 (66)</td>
<td>0.308</td>
</tr>
<tr>
<td>EMS witnessed</td>
<td>23 (12)</td>
<td>33 (15)</td>
<td>0.481</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>105 (56)</td>
<td>124 (56)</td>
<td>0.870</td>
</tr>
<tr>
<td>Shockable rhythms</td>
<td>135 (70)</td>
<td>152 (67)</td>
<td>0.541</td>
</tr>
<tr>
<td>AED attached</td>
<td>35 (18)</td>
<td>44 (19)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>AED attached</td>
<td>35 (18)</td>
<td>44 (19)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Survival to discharge</td>
<td>35 (18)</td>
<td>44 (19)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Field ROSC</td>
<td>66 (35)</td>
<td>80 (36)</td>
<td>0.034</td>
</tr>
<tr>
<td>Return of spontaneous circulation</td>
<td>35 (18)</td>
<td>44 (19)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
SESSION II DEVICES/CRT (continued)

THE ADDED VALUE OF ICD IMPLANTATION FOR SECONDARY PREVENTION IN PATIENTS WITH A VENTRICULAR ARHYTHMIA IN THE CONTEXT OF ACUTE CARDIAC ISCHEMIA AND A HISTORY OF MYOCARDIAL INFARCTION; SPIRIT STUDY

J. Brouwer1; J. Zweerink; L. de Roest; R. Nykild; C.C. de Cock; A.C. van Rossum; C.P. Allaart
(VU Medical Center. Amsterdam)
a.zweerink@vumc.nl

ABSTRACT

Purpose: Patients with a ventricular arrhythmia (VA) without reversible cause often have an indication for an ICD. In patients with a history of myocardial infarction (MI) and a VA in the context of an acute coronary syndrome (ACS), the trigger causing the VA is unclear. These patients often receive an ICD for secondary prevention. The purpose of this study is to analyze both the benefit and risk of ICD therapy in this patient population.

Methods: We conducted a retrospective, observational study. Patients who received an ICD from 2008 to 2011, were analyzed. Patients were included if they presented with VA in the context of an ACS, with a history of MI, but with LVEF>35%. Control groups consisted of patients admitted with VA with a history of MI, but without ACS at presentation, either with LVEF>35% or below 35%. The primary endpoint is to evaluate the incidence of appropriate and inappropriate ICD therapy.

Results: 146 patients were included, mean follow-up was 5.3 years. Appropriate ICD therapy occurred in 44.2% of the patients in the study group versus 54.9% and 65.2% in the control groups. 30.2% received an appropriate ICD shock versus 31.4% and 46.2% in the control groups. The primary endpoint was not reached.

Conclusion: Patients with a VA in the context of an ACS, with a history of MI, have a similar rate of appropriate ICD therapy compared to control groups of patients with secondary prevention INDICATIONS.

Keywords: ICD, ventricular arrhythmia; acute coronary syndrome

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Study group</th>
<th>Control group 1</th>
<th>Control group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male gender</td>
<td>40 (90.9%)</td>
<td>44 (88.6%)</td>
<td>42 (84.2%)</td>
</tr>
<tr>
<td>Age at implantation (yrs)</td>
<td>69.9 ±18.7</td>
<td>71.3 ±19.6</td>
<td>71.4 ±15.8</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td>46.3 ±7.45</td>
<td>46.39 ±7.506</td>
<td>55.83 ±15.888</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
<td>17 (39.5%)</td>
<td>19 (38.6%)</td>
<td>25 (49.1%)</td>
</tr>
<tr>
<td>Ventricular tachycardias</td>
<td>14 (33.7%)</td>
<td>12 (24.2%)</td>
<td>20 (39.4%)</td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>Event status (yrs)</th>
<th>N=43 (29.5%)</th>
<th>N=51 (34.9%)</th>
<th>N=81 (35.6%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate ICD therapy</td>
<td>19 (44.2%)</td>
<td>14 (27.4%)</td>
<td>40 (49.4%)</td>
<td>0.046</td>
</tr>
<tr>
<td>Appropriate ICD shock</td>
<td>13 (30.2%)</td>
<td>10 (19.6%)</td>
<td>29 (36.8%)</td>
<td>0.532</td>
</tr>
<tr>
<td>Mortality</td>
<td>5 (11.6%)</td>
<td>5 (10.2%)</td>
<td>17 (21.0%)</td>
<td>0.099</td>
</tr>
</tbody>
</table>

*p-Values less than 0.05.*
***P-value < 0.005 was considered statistically significant.

**UNIQUE** ICD therapy; LV end-diastolic volume; LVEDV; LVEF >35%

HEALTH CARE CONSUMPTION OF ADULTS WITH CONGENITAL HEART DISEASE MOTIVATED TO START USING MOBILE HEALTH

M.J. Schuring; Moreno Montani; D.R. Kooibergen; A.P.C.M. Backx; D. Rubbers-Visser; M. Sijbers, E.J. Mulder; B.J. Bouma (Academic Medical Center, Amsterdam)
mschuring@ama.croc.nl

ABSTRACT

Purpose: Patients with CHD who visited the outpatient clinic in the Academic Medical Center in Amsterdam were asked to fill out questionnaires on mHealth. Exclusion criteria for this study were being mentally impaired, or illiterate in Dutch. Of 124 adults 93% had a smartphone and 75% was motivated to start using mHealth. Data on health care consumption of these adults with CHD who are motivated to start using mHealth. We aimed to determine health care consumption of these adults with CHD who are motivated to start using mHealth.

Methods: Consecutive adult patients with CHD who visited the outpatient clinic in the Academic Medical Center in Amsterdam were asked to fill out questionnaires on mHealth. Exclusion criteria for this study were being mentally impaired, or illiterate in Dutch. Of 124 adults 93% had a smartphone and 75% was motivated to start using mHealth. Data on health care consumption of these adults with CHD who are motivated to start using mHealth.

Results: A substantial health care consumption was found in these patients with CHD motivated to start using mHealth (median age 38 range 18-64 years, 39% males). See Figure. Patients visited the outpatient clinic particularly. Of these patients 24% had one or more unplanned emergency visit and 36% had one or more hospital admission and/or intervention. A high health care consumption was seen in adults with CHD using antiarrhythmia (OR 10.9; P = 0.003) and adults with a complex CHD (OR 4.1; P = 0.023).

Conclusion: The relatively young adult CHD population motivated to start using mHealth has a high health care consumption. New mHealth initiatives in these patients with a chronic condition and a need for lifelong surveillance are needed in order to reveal whether a reduction in mortality and morbidity and improvement in quality of life can be achieved.

Keywords: Congenital heart disease; mobile health; heart failure; arrhythmia; quality of life

IMPROVED PATIENT SELECTION FOR CARDIAC RESYNCHRONIZATION THERAPY BY NORMALIZATION OF QRS DURATION TO LEFT VENTRICULAR DIMENSION

J. Zweerink; L. Wu; G.J. de Roest; R. Nykild; C.C. de Cock; A.C. van Rossum; C.P. Allaart
(VU Medical Center. Amsterdam)
a.zweerink@vumc.nl

ABSTRACT

Purpose: This study evaluates the relative importance of two components of QRS prolongation, myocardial conduction velocity and travel distance of the electrical wave front (i.e. path length), for the prediction of acute response to Cardiac Resynchronization Therapy (CRT) in left bundle branch block (LBBB) patients.

Methods: Thirty-two CRT candidates (injection fraction <35%, LBBB) underwent Cardiac Magnetic Resonance (CMR) imaging to provide detailed information on left ventricular (LV) dimensions, LV end-diastolic volume (LVEDV) was used as primary measure for path length, subsequently QRSd was normalized to LVEDV (i.e. QRSd divided by LVEDV) to adjust for conduction path length. invasive pressure-volume loop analysis at baseline and during CRT was used to assess acute pump function improvement, expressed as LV stroke work (SW) change.

Results: During CRT, SW improved by +38±46% (p = 0.001). Baseline LVEDV was positively related to QRSd (R=0.36, p = 0.044). Despite this association, a paradoxical inverse relation was found between LVEDV and SW improvement during CRT (R = -0.40, p = 0.025). Baseline unadjusted QRSd was found to be unrelated to SW changes during CRT (R = 0.16, p = 0.383), whereas normalized QRSd (QRSd/LVEDV) showed a strong correlation with CRT response (R = 0.49, p = 0.005). See figure 1. Other measures of LV dimension, including LV length, LV diameter and LV end-systolic volume, showed similar relations with normalized QRSd and SW improvement.

Conclusion: Since normalized QRSd reflects myocardial conduction properties, these findings suggest that myocardial conduction velocity rather than increased path length mainly determines response to CRT. Normalizing QRSd to LV dimension might provide a relatively simple method to improve patient selection for CRT.

Keywords: Cardiac Resynchronization Therapy (CRT); conduction velocity; Cardiac Magnetic Resonance (CMR)

Figure 1: Figure 1A shows scatter plots illustrating (A) no significant correlation between unadjusted QRS duration and acute stroke work (SW) changes during CRT; and (B) the positive correlation between QRS duration normalized to left ventricular end-diastolic volume (QRS/LVEDV), and acute SW changes during CRT.
SESSION III VALVULAR DISEASES

VALVE-CONTAINING PROSTHESES ARE A MAIN PREDICTOR AND TARGET OF INFECTIVE ENDOCARDITIS IN ADULTS WITH CONGENITAL HEART DISEASE

L.M. Kuipers; D.R. Kooibergen; M.Groenink; K.C.H. Peels; C.L.A. Reichert; M.C. Post; H.A. Nahid_8@hotmail.com; n.elfaquir@erasmusmc.nl

ABSTRACT

Purpose: Adult congenital heart disease (ACHD) predisposes to infective endocarditis (IE), while prostheses associated with repair or palliation may constitute additional IE targets. We aimed to determine the role of prosthetic material as a predictor and target of IE in ACHD.

Methods: We selected patients included in the CONCOR registry per October 2015. Predictors of IE were determined using Cox regression analysis, cumulative incidence using the complement Kaplan-Meier estimator. Data concerning the location and causative agent of IE was collected.

Results: In 14224 patients (51% female, median age 34 years), 124 IE cases occurred in 9356 person-years. Presence of valve-containing prosthetics strongly predicted IE risk (HR=6.88; 95% CI 3.58-8.38), short- and long-term after implantation (Univariate: HR=17.29; 7.34-40.70, 6.12 months; HR=15.91; 9.76-27.46, beyond 12 months; HR=26.3; 3.52-178.6). Valve-containing prosthetics predicted risk only in the first 6 months after implantation (HR=4.34; 3.83-4.84). Cumulative incidence at 2 years was 34.6% (95%CI:23.4-24.8). First cases: 100 patients in those with baseline valve-containing prosthetics, 5.3 (2.6-7.4) in those with only valve-containing prosthetics and 4.7 (2.7-9.1) in those without prosthetics (Figure). Among IE patients with valve-containing prosthetics, those prostheses were infected in 81%. Among IE patients with non-valve-containing prostheses, those prostheses were infected in 17%. Distribution of causative agents differed between prosthetic material (35% Staphylococcus, 13% Streptococci, 38% other, 13% culture negative) and native-tissue infections (17% Staphylococcus, 58% Streptococci, 16% other, 8% culture negative).

Conclusion: Our findings, essentially informing IE prevention guidelines, indicate valve-containing prostheses as an important risk-factor and target for IE in ACHD. Other prosthetics are not associated with increased long-term risk and rare targets of infection, if present.

Keywords: infective endocarditis; congenital heart disease; adults

RESULTS OF AORTIC VALVE REPAIR FOR AORTIC REGURGITATION

A.E. de Wit; P.M.J. Verhorst; G. Mecozzi (Universitair Medisch Centrum, Groningen)

Purpose: Valve-preserving surgery of the aortic valve has become a standard approach in the treatment of aortic root aneurysm and aortic regurgitation (AR). By avoiding lifelong anticoagulation therapy it offers a good alternative for the composite graft replacement. Recently there is a renewed interest in this valve-preserving surgery and it is only performed in a small number of expertise centers in the Netherlands, the Thoraxcentrum Twente (TCT) in Enschede. We studied the outcome of the aortic valve repair procedures looking at incidence of recurrent AR and valve-related complications, reduction in preoperative symptoms 3 months after the surgery (p < 0.001). The 30-day freedom from valve-related complications was 92%, 87% and 83% respectively at 1 and 3 years after surgery was 91% and 89% respectively. There was a significant reduction in preoperative symptoms 3 months after the surgery (p < 0.001). The 30-day freedom from relevant recurrent AR was 95% CI 3.58-8.38), short- and long-term after implantation (0-6 months: HR=17.29; 7.34-40.70, 6.12 months; HR=15.91; 9.76-27.46, beyond 12 months; HR=26.3; 3.52-178.6).

Conclusion: The freedom from postoperative aortic regurgitation; aortic valve repair; valve-preserving surgery

Keywords: infective endocarditis; congenital heart disease; adults

LONG TERM STRUCTURAL INTEGRITY AND DURABILITY OF THE MEDTRONIC COREVALVE SYSTEM AFTER TRANSCATHERTER AORTIC VALVE IMPLANTATION

N. El Faquir; B. Ren; M. Faurs; P. Geese; A.M. Maagden; M.L. Kalk; P.P. de Jaegere; H.A. Nahid_8@hotmail.com; n.elfaquir@erasmusmc.nl

Purpose: Long-term transcatheter heart valve durability data is scarce, yet transcatheter aortic valve implantation (TAVI) is already considered in low risk patients with a longer life expectancy. The aim of this study was to explore the long-term integrity and durability of the Medtronic CoreValve System (MCS) after TAVI.

Methods: 20 consecutive patients treated with MCS were included at least 4 years after TAVI for integrated multi-modality imaging, including transthoracic echocardiography (TTE), multislice computed tomography (CT) and rotational angiography (R-angio).

Results: Overall the median follow-up time was 5 years. By TTE no patient had significant increase in transprosthetic gradients, maximum aortic valve velocity or VTI ratio. CT was performed twice post-TAVI in 11 patients (median: 5 months and 6 years) while by TEE no patient showed significant increase in preoperative symptoms 3 months after the surgery (p < 0.001). The 30-day mortality rate was 2.9%. There were no late deaths.

Conclusion: Valve repair procedures in the TCT are performed with low morbidity and mortality in patients with AR and aortic root aneurysm. Valve repair surgery is performed safely in the TCT and with acceptable early and mid-term outcomes.

Keywords: infective endocarditis; aortic valve repair; valve-preserving surgery

THE EFFECT OF TRANSCATHETER AORTIC VALVE REPLACEMENT ON COGNITION – A PROSPECTIVE PILOT STUDY

R. de Vogel; M. Abawi; P. Agostoni; P. Stella (University Medical Center, Utrecht)

Purpose: Transcatheter aortic valve replacement (TAVR) is frequently associated with new cerebral ischaemic lesions detected with diffusion weighted magnetic resonance imaging (DWMRI) which could result in cognitive decline. The aim of this study was to prospectively evaluate the changes of cognitive performance after TAVR.

Methods: Eligible patients were prospectively enrolled and periprocedural, clinical and imaging data were collected. Cognitive status was measured before and 3-6 months after the procedure using Mini Mental State Examination (MMSE), quantitative clock-drawing test, Trail Making Test (TMT) and a verbal memory test.

Results: Fifty-five participants (mean age 80±6 years, 47% male) were enrolled from whom 58% (n=32) completed the follow-up, comparable in age (78±6 years) and level of education. Postoperative, immediate verbal memory significantly improved compared to baseline (29.9±4.1 vs. 29.9±7.7, p=0.02), and a trend toward better delayed verbal memory was seen during the follow-up (4.1±2.2 vs. 4.7±1.1, p=0.08).

Conclusion: Patients undergoing transcathether aortic valve replacement were less likely to develop cognitive decline at short-term follow-up. However, there was significantly improvement in immediate verbal memory suggesting better cerebral perfusion after the procedure.

Keywords: Transcatheter Aortic Valve Replacement; stroke; cognition
SESSION III VALVULAR DISEASES (continued)

5-YEAR OUTCOMES AFTER PERCUTANEOUS MITRAL VALVE REPAIR WITH THE MITRACLIP: DEFINING SELECTION CRITERIA

J.E. Velu; F.A. Kortlandt; T. Hendrikx; R.A.J. Schuur; A.J. van Boven; B. Van den Branden; T.A.S. Van der Heyden; B.J. Bouma; Benno J. Rensing; J. Baan (Academic Medical Center, Amsterdam)
J.E. Velu@amc.nl

ABSTRACT

Purpose:
The aim of the study was to assess the durability of the outcome after percutaneous mitral valve repair in order to optimize patient selection.

Methods:
Between January 2009 and January 2016, 618 consecutive patients were included in the registry and treated with 1–4 MitraClips in 5 Dutch centers. The survival of the treated patients was analyzed up to 5 years. The outcome was quantified with survival, symptoms, and mitral regurgitation (MR) grade.

Results:
The cumulative survival was 97% after 30 days, 84% after 1 year and 40% after 5 years. Preprocedural, 13% of the patients were in NYHA class I or II and 69% of the patients after 3–5 years 2 were preprocedural present in 44% of the patients and in 49% after 1 year. Mortality rate Cox regression analysis showed that increased age 70–75 (HR:2.3;5.3;HR-based score:2), previous valve surgery (HR:2.1;4.3;HR-based score:1), prior NYHA class (HR:4.0;9.0;HR-based score:2), elevated NT-proBNP levels 2000–4999 (HR:1.1;7.1;HR-based score:1.2) and NYHA grade 3 (HR:1.1;HR-based score:1) predicted survival after MitraClip implantation.

Conclusion:
The current risk model identifies a substantial well-defined group of patients with a poor progression and a limited reduction in symptoms after MitraClip treatment in whom MitraClip treatment is questionable. The risk model can be used as a clinical tool to improve output in real-world patients referred for MitraClip treatment. The vast majority over 70% of the patients benefits from MitraClip treatment in terms of survival and symptom reduction.

Keywords:
MitraClip; mitral regurgitation; riskmodel

Figure 1. HR-based score. HR: hazard ratio.

PROGRESSIVE TRICUSPID REGURGITATION IS ASSOCIATED WITH ADVERSE EVENTS IN REPAIRED TETRALOGY OF FALLOT

O.J. Woudstra; J.P. Bakma; M.M. Winter; P. Kols; M.R.M. Jongbloed; W.V. Vliegen; B.J.M. Mulder; B.J. Bouma (Academic Medical Center Amsterdam)
O.J. Woudstra@amc.nl

ABSTRACT

Purpose:
The course of tricuspid regurgitation (TR) in repaired tetralogy of Fallot (TOF) and risk factors for TR deterioration are unknown. This study aims to identify the course of TR risk factors for TR deterioration, and whether TR progression is predictive for adverse events in TOF patients.

Methods:
In this dual-center cohort study, TOF patients included in a prospective national registry with ≥2 echocardiography’s available were included. TR grade and data on adverse events (death, heart failure, ventricular tachycardia, supraventricular tachycardia) were collected. Progressive TR was defined as increase into moderate TR or severe TR at follow-up.

Results:
226 patients were included (57% men, age 33±12 years). TR severity was mild in 76% and moderate in 24% of patients. During 8.2±3.6 years of follow-up, TR grade remained stable in 88% and progressed in 12% of patients. Criteria for progressive TR were fulfilled after 4 (72.00±20.00) years; 17 patients increased from mild to moderate, 5 from mild to severe, 9 from moderate to severe, and 1 remained severe. Age over 40 (HR:3.2;95%CI:1.3-8.18), NYHA class ≥3 (OR:2.68, 95%CI:1.08-6.60), and pulmonary regurgitation fraction ≥20% (OR:3.44, 95%CI:1.38-8.57) were associated with progressive TR. 68 events occurred in 51 patients. In multivariable analysis, progressive TR was associated with adverse events (HR 2.78, 95%CI:0.97-7.05).

Conclusion:
Progression of TR occurred in 12% of TOF patients and was associated with adverse events. Symptomatic patients over 40 years of age undergoing pulmonary valve replacement should be considered for tricuspid valve repair.

Keywords:
Tetralogy of Fallot; tricuspid regurgitation

Figure 1. Kaplan Meier eventfree survival curve of patients with stable tricuspid regurgitation (TR) and patients with progressive TR.

CURRENT MITRACLIP EXPERIENCE, SAFETY AND EFFICACY IN THE NETHERLANDS

Z. Rahhab; F. Kortlandt; J. Velu; R.A.J. Schuur; V. Delgado; P. Tonino; A.J. van Boven; B. Van den Branden; M. Voelkel; J. Horntje; M. van Wely; K. van Houwelingen; G. Bleeker; J. Baan; J van der Heyden; N.M. Van Mieghem (Erasmus Medical Center, Rotterdam)
Z. Rahhab@erasmeun.nl

ABSTRACT

Purpose:
MitraClip is a percutaneous edge-to-edge repair technique for patients with at least moderate-severe mitral regurgitation (MR). Data on procedural safety and efficacy in the Netherlands is scarce. We aim to provide an informative overview about the current MitraClip procedural experience in the Netherlands.

Methods:
Anonymized demographic and procedural data of 1151 consecutive MitraClip patients, treated between January 2009 and June 2016, from 12 Dutch Hospitals were analyzed. Data was collected by product-specialists in collaboration with local operators. Effect on MR was intra-procedurally assessed by transoesophageal echocardiography. Technical and device success were defined according to modified-MVARC definitions.

Results:
The overall cohort had a median (IQR) age of 76 (69-82) years and 59% were males. Patients presented with MR ≥ moderate at baseline with a clear predominance of functional MR (72%), 11% (35%) patients were treated with one Clip, 48% (42%) with ≥2 Clips and 54% (5%) received no Clip. The number of patients with ≥2 Clips increased from 22% in 2009 to 55% in 2016. Device technical success were respectively 91% and 95%, and was consistent over the years. Overall 94% had a significant MR reduction with MitraClip. Technical success declined from 145 minutes in 2009 to 55 minutes in 2016.

Conclusion:
MitraClip experience in the Netherlands is growing, shows a stable patient selection practice with excellent technical and procedural success. Procedure time decreased and more patients were treated with ≥2 Clips.
THORACOSCOPIC SURGICAL ABLATION IN PATIENTS WITH ADVANCED ATRIAL FIBRILLATION: RESULTS FROM THE AFACT STUDY ON HEALTH-RELATED QUALITY OF LIFE IN RELATION TO PROCEDURAL OUTCOME

W.R. Berger; A.H.G. Driessen; M.F.A. Bierhuizen; F.R. Piersma; N.W.E. van den Berg; J. Neefs; C.P. Malfait; C.F. Kolling; L.P. van Boxem; J.R. de Groot (Academic Medical Center Amsterdam)

w.tberger@amc.uva.nl

ABSTRACT

Purpose: The Atrial Fibrillation Ablation and AutonomiC Modulation via Thoracoscopic Surgery (AFACT) study assessed the efficacy and safety of ganglion plexus (GP) ablation in patients with advanced atrial fibrillation (AF) undergoing thoracoscopic surgical ablation. In this substudy, we evaluated the effect on quality of life (QoL) at 6 and 12 months follow-up.

Methods: Patients with paroxysmal or persistent AF undergoing thoracoscopic AF surgery were randomized to either additional surgical ablation of the four major GPVs or control. Follow-up was performed every 3 months for 1 year. Short form 36 (SF-36) QoL questionnaires were collected at baseline, 6 and 12 months follow-up. AF recurrence was defined as any atrial tachypalpability documented on ECG or >30 seconds on 24h-Holter after a smooth blanking period.

Results: In the AFACT study, 240 patients (60±8 years, 73% men, 68% enlarged left atrium, AF duration 6±15 years, 53% persistent) were included and randomized to GP ablation (n=117) or control (n=123). In both randomization groups patients showed significant improvement in physical and mental health at both p<0.01 and 12 months (both p<0.01), relative to baseline. Patients with AF recurrence (33%) showed a significant increase in physical health (68% p<0.01), but not mental health, and scored significantly lower on 6/8 SF-36 subscales compared to the general Dutch population, while patients without recurrence had similar QoL scores as the general population after 12 months follow-up (figure 1).

Conclusion: Thoracoscopic AF surgery results in a substantial improvement in QoL in patients with advanced AF, regardless of additional GP ablation. Patients without AF recurrence show greater improvement in quality of life than patients with AF recurrence.

Keywords: atrial fibrillation; thoracoscopic AF surgery; quality of life
SESSION IV  ATRIAL FIBRILLATION/ARYRHYTHMIAS (continued)

VARIATION IN ATRIAL EXCITATION DURING SINUS RHYTHM UNRAVELED BY HIGH-RESOLUTION EPICARDIAL MAPPING

E.M.J.P. Mouws; E.A.H. Lanters; C.P. Teuwen; J.M.E. van der Does; C. Kik; P. Knops; A. Yaksh; J.A. Bakkers; A.J.C. Bogers; N.M.S. de Groot (Erasmus Medical Center, Rotterdam)
e.mouws@erasmusmc.nl

ABSTRACT

Purpose:
Knowledge of atrial excitation during sinus rhythm (SR) enables detection of propagation abnormalities associated with development of atrial fibrillation (AF). We investigated differences in atrial excitation during SR between patients with ischemic and/or valvular heart disease (IHD, VHD, I/VHD) with or without AF.

Methods:
Intra-operative epicardial mapping (N=128/192 electrodes, inter-electrode distances: 2mm of the right atrium (RA), Bachmann’s bundle (BB), left atrioventricular groove (LAVG) and pulmonary vein area (PVA) was performed during SR in 381 patients (289 male; age 67±10 years) with IHD and/or VHD.

Results:
SR origin was located in the RA superior intercaval region in 232 patients. BB activation occurred via one wavefront from right to left (N=163, 64%), from the central part (N=18, 7%) or via multiple wavefronts (N=72, 28%). Central activation of BB more often occurred in patients with I/VHD or VHD (I/VHD: N=9, 17%; VHD: N=7, 10%; IHD: N=2, 2%; p=0.024). LAVG activation occurred via 1) BB: N=108, 43%, 2) PVA: N=9, 3% or 3) BB and PVA: N=136, 54%; depending on which route had the shortest interatrial conduction time (p<0.001). VHD patients more often had LAVG activation via PVA. Total activation times were higher in patients with AF (AF: 136±20 (92-186) ms; No AF: 114±17 (74-156) ms; p<0.001), due to prolongation of RA (p=0.018) and BB conduction times (p<0.001). Epicardial breakthroughs (EBs) occurred mainly at RA and were more often observed in IHD patients (IHD: N=111, 48%; VHD: N=12, 15%; I/VHD: N=13, 20%; p<0.001).

Conclusions:
Atrial excitation is affected by underlying heart disease and AF. Interatrial conduction via both BB and PVA, instead of BB only, occurs more frequently in VHD patients. EBs are more often observed on RA. Alterations in atrial excitation associated with the pathogenesis of AF also involves the RA.

Keywords
atrial fibrillation; atrial excitation; high-resolution epicardial mapping

LEFT VENTRICULAR HYPERTROPHY IN LOW RISK ATRIAL FIBRILLATION PATIENTS

Ö. Erküner; E.A.M.P. Dudink; B. Weijs; R. Nieuwlaat; H.J.G.M. Crijns (Maastricht University Medical Center, Maastricht)
omer.erkuner@mumc.nl

ABSTRACT

Purpose:
To assess differences in progression of atrial fibrillation (AF) and the occurrence of major adverse cardiac and cerebrovascular events (MACCE) in low-risk AF patients with and without echocardiographic left ventricular hypertrophy (LVH).

Methods:
We included 893 patients from the Euro Heart Survey on AF with a baseline echocardiogram and rhythm follow-up. Patients without risk factors for stroke according to CHA2DS2-VASc score were included, disregarding gender and hypertension. The occurrence of AF progression and MACCE after 1-year were assessed for the groups with and without hypertension, i.e. isolated hypertension and solitary AF respectively, subdivided by the presence of LVH. AF progression was defined as paroxysmal AF at baseline becoming persistent/permanent AF after 1-year.

Results:
LVH was present in 64 (13%) of 486 solitary AF patients and in 134 (33%) of 407 isolated hypertension patients. In the hypertensive patients with LVH, AF progression was more prevalent (21.9% vs. 8.6%, p=0.014), occurrence of MACCE did not differ. In contrast, in the solitary AF group, MACCE was significantly more prevalent in the patients with LVH (10.6% vs. 2.1%, p=0.009), whilst AF progression rates were similar.

Conclusion:
Solitary AF patients with isolated LVH show more MACCE after 1 year compared to those without, suggesting early vascular remodelling as a mechanism. In contrast, isolated hypertension patients with LVH show more AF progression. LVH seems a key marker of a vulnerable vascular system in patients with low-risk AF. Tackling LVH by vascular prophylactic or anti-hypertension therapy may decrease MACCE and AF progression in these patients.

Keywords:
atrial fibrillation; left ventricular hypertrophy; major adverse cardiac and cerebrovascular events

Figure 1. Differences in AF progression and MACCE rates after 1 year of follow-up for patients with and without LVH, subdivided in solitary AF and isolated HT.

AF: atrial fibrillation; HT: hypertension; LVH: left ventricular hypertrophy; MACCE: major adverse cardiac and cerebrovascular events.

Sessions
SESSION IV ATRIAL FIBRILLATION/ARYRTHMIAS (continued)

NOACS, ARE THEY SAFE TO INITIATE IN CONGENITAL HEART DISEASE?
W. Yang; J.F. Heijdenaal; J.R. de Groot; R.J.G. Peters; G.T. Seikowska; F.J. Meijboom; T.C. Teunissen; C. Veen; M.C. Post; B.J. Bouma; B.J.M. Mulder (Academic Medical Center Amsterdam; NLH, Utrecht)

h.yang@amc.uva.nl

ABSTRACT

Purpose: Efficacy and safety of new oral anticoagulants (NOACs) have not yet been demonstrated in adult with congenital heart disease (ACHD). Using The Non-vitamin K antagonist oral anticoagulants (NOACs) for thromboembolic prevention (NOTE) registry, we aim to evaluate the safety of initiation of NOACs in ACHD.

Methods: This is a multicenter prospective registry of ACHD using NOAC for prevention of thromboembolism. At baseline, patient characteristics and medical history were collected. The period of evaluation for the safety of NOAC initiation was set within 30 days after initiation of NOACs. Patients were followed 1 month or 6 months after initiation of NOACs to register any adverse events (thromboembolism, bleeding events, death, intervention).

Results: So far, 208 adults (median age 43 years, 55% male) with various CHD (simple 15%; moderate 44%; complex 41%) using NOACs (apixaban 46%; rivaroxaban 30%; dabigatran 21%; edoxaban 2%) have been included. Most patients (n=203) used NOAC due to non-valvular atrial arrhythmias (median CHA2DS2-VASc 1 [IQR 0-2];median HASBLED 0[ IQR 0-1]). Before NOAC initiation, 52% used vitamin K antagonist, 4% used antiplatelet agent. The 30-days evaluation was taken place in 105 patients. No major adverse event took place (see table 1). Five patients had complaints of minor bleeding, most often with nose bleeding (n=3), menorrhagia (n=1) and hematoma (n=1). Other side effects such as dizziness, headaches, weakness, cutaneous eruption were only rarely reported (n=4). One patient dropped out due to frequent nose bleeding.

Conclusion: Initiation of NOACs in ACHD seems safe with no major adverse events and with limited minor side effects.

Keywords: adult congenital heart disease; NOAC; anticoagulation

Table 1. Adverse events under the use of NOACs within 1 month follow-up.

<table>
<thead>
<tr>
<th>adverse event</th>
<th>n</th>
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</thead>
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<td>Major adverse event (thromboembolism, major bleeding, intervention, death)</td>
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</tr>
<tr>
<td>Minor bleeding</td>
<td>1</td>
</tr>
<tr>
<td>Side-effects</td>
<td>4</td>
</tr>
<tr>
<td>Drop-out</td>
<td>1</td>
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</tbody>
</table>

DOUBLE-CONTRAST, SINGLE-PHASE COMPUTED TOMOGRAPHY ANGIOGRAPHY FOR RULING OUT LEFT ATRIAL APPENDAGE THROMBUS PRIOR TO ATRIAL FIBRILLATION ABLATION
C. Teunissen; J. Habets; B.K. Velthuis; M.J. Cramer; P. Luh (University Medical Center Groningen; Groningen, Netherlands)
c.teunissen-2@umcutrecht.nl

ABSTRACT

Purpose: Prior to atrial fibrillation (AF) ablation, computed tomography angiography (CTA) is increasingly used for left atrial appendage (LAA) thrombus detection. LAA filling defects on CTA may represent thrombus or incomplete contrast mixing with blood. A pre-bolus of contrast material with delay before the CTA contract bolus can help distinguish between thrombus and incomplete contrast mixing. We present results from a double-contrast, single-phase CTA protocol used in our daily clinical practice.

Methods: In patients who underwent AF ablation between 2011-2015, double-contrast, single-phase CTA was performed prior to ablation. Two contrast boluses (30 and 70 ml) with 25-second interval delay were administered followed by prospectively triggered cardiac CTA. Only patients with left atrial (LA) or LAA filling defects underwent transesophageal echocardiography (TEE) to rule out thrombus.

Results: Prior to ablation, 605 CTA-scans were performed (median radiation dose: 3.1mSv). In 579 CTA-scans (95.7%), the LA and LAA completely filled with contrast. In 26 CTA-scans (4.3%) the LAA showed a filling defect where thrombus could not be excluded. In 2 of those 26 patients (7.7% and 0.3% of the total population), TEE verified LAA thrombus. Low-risk LAA filling defects on CTA (n=7/26) with an inhomogeneous aspect, Hounsfield Unit values >100, and an indefinite border were all caused by incomplete contrast mixing. No thromboembolic complications occurred perioperatively or during 6 month follow-up.

Conclusion: Prior to AF ablation, incidence of LAA filling defects on double-contrast, single-phase CTA is low. TEE remains warranted in all but low-risk filling defects to rule out thrombus.

Keywords: atrial fibrillation; computed tomography angiography; left atrial appendage thrombus

Figure. Three patients with false positive CTA scan.

LAA filling defects were classified as high (A), intermediate (D) and low (G) risk of thrombus. The patients with a high and low-risk filling defect were in AF during performance of CTA, the patient with an intermediate-risk filling defect was in sinus rhythm. A: CTA in axial view showing LAA filling defect (yellow arrow). The area of low attenuation shows a homogeneous aspect, HU 50-100 and a well-defined convex border. B: TEE showing severe spontaneous echo contrast (red arrow) in the LAA without thrombus. C: low velocity measured by pulse Doppler. D: CTA in axial view showing LAA filling defect (yellow arrow). The area of low attenuation shows a homogeneous aspect, HU 70-110 and a well-defined convex border. E: TEE showing no thrombus and no spontaneous echo contrast (red arrow). F: high velocity measured by pulse Doppler. G: CTA in axial view showing LAA filling defect (yellow arrow). The area of low attenuation shows a homogeneous aspect, HU 100-150 and an indefinite border. H: TEE showing moderate spontaneous echo contrast in the LAA without thrombus (red arrow). I: low velocity measured by pulse Doppler.
SESSION V CORONARY ARTERY DISEASE / ELECTROPHYSIOLOGY

VALIDATION OF NATIONAL CLAIM DATA IN ACUTE MYOCARDIAL INFARCTION PATIENTS.

D.C. Eindhoven; L.N. van Staveren; J.A. van Erkelens; A. Mosterd; J. van Wijngaarden; P.J.W. van de Ven; J.E. Davies; N. van Royen (VU Medical Center, Amsterdam)
d.c.eindhoven@vumc.nl

ABSTRACT
Purpose: The purpose of the current study is to validate national claim data of patients after acute myocardial infarction in the Netherlands.

Methods: In order to assess validity of national claim data, four representative hospitals were assessed by comparing national claim data of each hospital (National registry) to data obtained from reviewing local patient records (Validation registry). In both registries, the national diagnosis-codings for ST-Elevated myocardial infarction (STEMI) and Non-ST-Elevated myocardial infarction (NSTEMI) in 2012 and 2013 were extracted. Additionally, data on medication use at one year after myocardial infarction was extracted from the Dutch Pharmacy Information System (FIS) (National registry) and from the local patient records of four Dutch hospitals (Validation registry). The data was compared at three stages: 1) validation of diagnosis and treatment coding; 2) validation of allocation of follow-up hospital; 3) validation of follow-up medical treatment after 365 days.

Results:
In total, 3,980 patients (National registry) and 4,026 patient (Validation registry) were compared at baseline. After one year follow-up, 2,714 acute myocardial infarction patients from the national registry were evaluated. The validation registry resulted in 2,714 patients and in 3,959 cases information from the patient records was available. Baseline characteristics and individual medication use are presented in Table 1.

Conclusion:
Data on optimal medical treatment in Dutch acute myocardial infarction patients extracted by national diagnosis-codings are comparable with local patient records. The use of claim data as quality measurement will be discussed at the scientific meeting of the Netherlands Society of Cardiology.

Keywords: validation; quality registries; optimal medical treatment.

Table 1: Comparison of National registry and Validation registry.

<table>
<thead>
<tr>
<th>Description</th>
<th>National registry</th>
<th>Validation registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>3,980</td>
<td>4,026</td>
</tr>
<tr>
<td>Male gender</td>
<td>66.8 ± 12.8</td>
<td>66.8 ± 12.8</td>
</tr>
<tr>
<td>Deceased &lt; 365 Days</td>
<td>13.8 (6.94)</td>
<td>247 (6.94)</td>
</tr>
<tr>
<td>Deceased &lt; 180 Days</td>
<td>386 (10%)</td>
<td>301 (8%)</td>
</tr>
<tr>
<td>Final diagnosis</td>
<td>2,068 (52%)</td>
<td>2,041 (52%)</td>
</tr>
<tr>
<td>STEMI</td>
<td>1,952 (49%)</td>
<td>1,940 (49%)</td>
</tr>
<tr>
<td>Treated with percutaneous coronary intervention</td>
<td>2,079 (52%)</td>
<td>2,041 (52%)</td>
</tr>
<tr>
<td>One year follow-up</td>
<td>2,714</td>
<td>2,714</td>
</tr>
<tr>
<td>Number of patients expected for follow up</td>
<td>2,714</td>
<td>2,714</td>
</tr>
<tr>
<td>Total number of patients on whom information is available</td>
<td>1,995</td>
<td>1,995</td>
</tr>
<tr>
<td>Reperfusion treatment</td>
<td>2,698 (60%)</td>
<td>2,698 (60%)</td>
</tr>
<tr>
<td>Thrombolytic therapy</td>
<td>2,507 (53%)</td>
<td>2,507 (53%)</td>
</tr>
<tr>
<td>Stents</td>
<td>2,634 (53%)</td>
<td>2,634 (53%)</td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>2,306 (50%)</td>
<td>2,306 (50%)</td>
</tr>
<tr>
<td>ACE inhibitor</td>
<td>2,218 (46%)</td>
<td>2,218 (46%)</td>
</tr>
<tr>
<td>Continuous data is presented as mean ± standard deviation. Categorical data is presented as number and percentages.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SESSION V CORONARY ARTERY DISEASE/ ELECTROPHYSIOLOGY (continued)

PREVENTION OF SUDDEN CARDIAC DEATH IN ADULTS WITH CONGENITAL HEART DISEASE. PERFORMANCE OF CURRENT GUIDELINES

J.T. Vehmeijer; Z. Kovack; W. Budts; L. Harris; B.J.M. Mulder; J.R. de Groot (Academic Medical Center, Amsterdam)

ABSTRACT

Purpose: Sudden cardiac death (SCD) is one of the main causes of mortality in adults with congenital heart disease (ACHD). Validated risk prediction models for SCD are lacking. The 2014 Consensus Statement on Arrhythmias in ACHD specified ICD indications for ACHD for the first time. These were mainly extrapolated from patients with acquired heart disease, and later largely adopted by the ESC. We aim to assess the discriminative ability of these ICD indications in ACHD.

Methods: Of 25,790 ACHD in an international multicenter registry, we identified all SCD cases, matched at a 1:n ratio to living controls by age, gender, congenital defect and surgical repair. We assessed all primary prevention ICD indications listed in both documents. We excluded patients with a class II indication. To test discriminative ability, we used conditional logistic regression models to calculate odds ratios (OR) and ROC-curves with area under the curve (AUC).

Results: Consensus statement: 125 cases (excluding Eisenmenger patients – a class III indication – median age: 33 years, 67% males) and 230 controls were analyzed. In total, 41% of SCD cases and 18% of controls had an ICD indication (OR 5.9, p < 0.001, AUC: 0.68). ESC guidelines: 157 cases (including Eisenmenger patients, median age at death 33 years, 64% males), and 252 controls were analyzed; 35% and 14% had an ICD indication, respectively (OR 5.5, p < 0.001, AUC: 0.67).

Conclusion: Only a limited number of SCD cases had an ICD indication according to these guidelines. This may cause under-utilization of ICDs in ACHD. The discriminative ability of both guidelines was also poor. Guideline indications can only be extrapolated from acquired heart disease to ACHD to a limited extent. Risk stratification for SCD in ACHD therefore remains a work in progress.

Keywords: sudden cardiac death; implantable cardioverter-defibrillator; guidelines; congenital heart disease

POST-MORTEM GENETIC TESTING IN YOUNG VICTIMS OF SUDDEN ARRHYTHMIC DEATH SYNDROME

L. Safaroglu; H. Rajo; E.M. Lodder; J. Nare; R. Tadros; J. Skinner; J. Thalhammer; C. van den Broek; M. Cohen; M. Christiansen; S. Cook; M. Shepard; S. Shah; A.A.M. Wijns; C.R. Bezzina; E.R. Beke (St. George’s University of London, London, UK)

ABSTRACT

Purpose: Sudden cardiac death in the young (<40 years) can occur as a result of inherited cardiomyopathy or primary electrical disease. If sudden death is unexplained despite an appropriate autopsy and toxicological assessment the term Sudden Arrhythmic Death Syndrome (SADS) may be used. Establishing a genetic etiology of SADS allows for appropriate screening and management of relatives at risk of SADS. We assessed the yield of postmortem next-generation sequencing (NGS) in young victims of SADS.

Methods: We performed NGS in 189 young sudden cardiac death cases that had structurally normal hearts and negative toxicological analysis at autopsy. NGS targeted the coding region of genes associated with primary electrical disease (n=35) and cardiomyopathy (n=64). Variants with a minor allele frequency >1/1000 in public databases, synonymous variants not located at splice sites were excluded from further analysis. The retained variants were prioritized using a number of filters that combined in silico pathogenicity prediction tools, conservation and allele frequency in the general population. The pathogenicity of each variant was further assessed through an extensive literature review. Variants were finally classified as ‘pathogenic’, ‘likely-pathogenic’ and ‘variant of unknown significance’.

Results: NGS was successful in 182 cases. Ten patients (5.5%) were found to harbour a ‘pathogenic’ variant in genes linked to the primary electrical diseases, whereas no patient had a ‘pathogenic’ variant in a cardiomyopathy gene. In addition, 20 patients (11%) and 19 patients (10%) had “likely-pathogenic” variants in respectively primary electrical disease and cardiomyopathy genes. In 63 patients (35%), no rare variant was identified. RyR2 was the gene with the most pathogenic/likely pathogenic variants.

Conclusion: We identified pathogenic/likely pathogenic variants in 27% of SADS cases. These variants represent a starting point for genotype-phenotype studies in the respective families that may allow for presymptomatic diagnosis in a substantial number of families.

Keywords: sudden cardiac death; post-mortem genetic testing; next-generation sequencing
SESSION VI HEART FAILURE

GENDER-RELATED LONG-TERM MORTALITY IN PATIENTS WITH ACUTE HEART FAILURE: EQUAL PROGNOSTIC IMPROVEMENT BETWEEN MEN AND WOMEN IN RECENT YEARS

J.C. van den Berge, A.A. Constantinescu, R.T. van Domburg, J.W. Decker; K.M. Aukema

Radboud University Medical Center, Nijmegen

ABSTRACT

Purpose:

Since there is limited and inconsistent data regarding gender-related long-term mortality among patients with acute heart failure (AHF), we investigated and compared long-term mortality in men and women with this syndrome. Further, we determined whether this temporal trend in mortality over the last decades was different between both genders.

Methods:

From 1985 to 2008, all consecutive patients aged 18 years and older admitted with AHF at the Intensive Coronary Care Unit were included in this prospective registry.

Results:

We included 1810 patients (64% men). Compared to women, men were generally three years younger; in addition, men had more commonly ischemic HF, previous HF and HF with poor left ventricular ejection fraction. Conversely, women more often had diabetes and hypertension. Men had a significantly higher mortality than women (Figure 3), with an increase in mortality rates of 7% versus 2% (adjusted HR 1.36; 95% CI 1.18-1.55). Compared to the first two decades, ten-year mortality risk of men decreased in the most recent period (adjusted HR 0.85; 95% CI 0.70,907). A comparable improvement of the long-term prognosis was observed in women (adjusted HR 0.87; 95% CI 0.71-1.06).

Conclusion:

Men admitted with AHF had higher long-term mortality rates as compared to women. Importantly, the recent improvement in long-term prognosis was comparable between both men and women, suggesting an equal survival benefit for both genders from therapeutic developments in the last decades. Despite the encouraging temporal trend, new therapeutic options are needed in both men and women in order to improve the poor prognosis of AHF.

Keywords:

acute heart failure; gender differences; mortality over time

Figure 3. Kaplan-Meier curve of cumulative mortality: men vs. women.

GALECTIN-3 AS A MARKER OF MYOCARDIAL FIBROSIS IN HYPERTROPHIC CARDIO-MYOCARDIOPATHY


Erasmus Medical Center, Rotterdam

ABSTRACT

Purpose:

Myocardial fibrosis, assessed with late gadolinium enhancement (LGE) imaging, is a characteristic feature of patients with hypertrophic cardiomyopathy (HCM) and associated with adverse prognosis. Galexin-3 is a serum biomarker that has been related to fibrogenesis and holds prognostic value in patients with heart failure. As galexin-3 might be a convenient marker of fibrosis and prognosis in HCM, we sought to assess the association between galexin-3 and LGE in patients with HCM.

Methods:

HCM patients without a history of coronary artery disease (n=95) underwent cardiovascular magnetic resonance imaging (1.5T) with cine and LGE imaging to assess left ventricular (LV) function and mass. LV mass was indexed to body surface area (BSA). LV ejection fraction was determined using Simpson’s biplane and Teichholz methods. Cardiac troponin T (cTnT), N-terminal pro-B-type natriuretic peptide (NT-proBNP), and Galexin-3 (Gal-3) were assessed at baseline and again 2 years later. Median follow-up time was 17 months.

Results:

A total of 95 patients were included (70% male, age 39±12 years old, right ventricular ejection fraction 44±8%; VO2max 81±18% of predicted). Patients had, on average, a normal mT3/M460 (0.6) and heart failure-related M3 (46±7) quality of life (mT3/M460 55). In multivariable analysis, low peak heart rate (β: 0.30/hr; p=0.0002), low peak systolic blood pressure (β: 0.17/mmHg, p=0.004), and reduced heart failure-related quality of life (β: 0.77/point; p=0.001) were associated with reduced exercise capacity. In subgroup analysis of 25 patients with spirometry analysis, reduced forced expiratory volume in 1 sec (p=0.001) and forced volume vital capacity (p=0.003) were associated with reduced exercise capacity.

Conclusion:

In adults with tetralogy of Fallot, reduced exercise capacity was related with chronotropic dysfunction and pulmonary dysfunction. Therefore, pulmonary valve replacement is not always the right solution in symptomatic TOF patients, cardiopulmonary rehabilitation may be more useful in a subset of patients.

Keywords:

Tetralogy of Fallot; congenital heart disease; exercise testing
GROWTH-DIFFERENTIATION FACTOR 15 PREDICTS ADVERSE CARDIAC EVENTS IN ADULTS WITH CONGENITAL HEART DISEASE

V.J.M. Baggen; A.E. van den Bosch; I.A. Eindhoven; M. Witsenburg; J.A.A.E. Couperus; E. de Mol; H.C. Lagrand; B.J.M. Mulder; B.J. Bouma (Academic Medical Center Amsterdam)

ABSTRACT

Purpose: Growth-differentiation factor 15 (GDF-15) offers prognostic information in coronary heart disease and chronic heart failure. Its usefulness as potential biomarker in adults with congenital heart disease (ACHD) is unknown. The objective of this study is to investigate the association of GDF-15 with adverse cardiac events in ACHD.

Methods: We prospectively included consecutive patients who routinely visited the adult congenital cardiologist outpatient clinic between April 2011 and April 2013. Patients underwent clinical examination, electrocardiography, echocardiography and venous blood sampling. Plasma GDF-15 was measured by batch analysis. The primary endpoint was a composite of death, heart failure, hospitalization, arrhythmia, thromboembolic event or cardiac re-intervention and the secondary endpoint was a composite of death or heart failure. Cox regression was used to assess the predictive value of GDF-15, adjusted for age, sex, systemic ventricular function and NT-proBNP.

Results: In total, 587 patients were included (median age 33 [IQR 25-41] years, 58% male, 90% New York Heart Association class I). Patients were followed for a median of 42 [IQR 37-46] months. GDF-15 was independently associated with the primary endpoint (n=160, adjusted hazard ratio per two-fold increase 1.34 [95% CI 1.09-1.65], P = 0.006) and with the secondary endpoint (n=48, adjusted hazard ratio per two-fold increase 1.60 [95% CI 1.13-2.26], P = 0.008).

Conclusion: GDF-15 provides prognostic information, independent of age, sex, systemic ventricular function and NT-proBNP. Therefore, GDF-15 could play an important role in the monitoring and management of patients with ACHD.

Keywords: adult congenital heart disease; biomarkers; growth factors; prognosis

DOES BOSENTAN IMPROVE CLINICAL OUTCOME OF ADULTS WITH CONGENITAL HEART DISEASE UNDERGOING CARDIAC SURGERY?

I.M. Brui; A.C.M.J. van Rai; M.J. Schuring; D.R. Koelberg; M.G. Nizelkamp; B.A.J.M. Van der Ven; E.J. Lag; B.J.M. Mulder; B.J. Bouma (Academic Medical Center Amsterdam)

ABSTRACT

Purpose: During cardiac surgery, an endothelin-1 release induces elevation of the pulmonary vascular resistance (PVR). We determined whether perioperative treatment with bosentan, a specific ET-A receptor blocker, can improve outcome in adults with congenital heart disease (CHD) undergoing cardiac surgery.

Methods: In a prospective randomized open label study, adults with CHD who were scheduled for cardiac surgery, were randomized to either bosentan 62.5 mg/kg/min intravenously (treatment group) or no therapy (control group). Primary endpoint was peakVO2 six weeks postoperatively. Secondary endpoints were intensive care unit admission time, tricuspid annular plane systolic excursion (TAPSE) and NT-proBNP at six and twelve weeks postoperatively.

Results: Sixty-eight patients were included (mean age 44 years, 63% male): 36 receiving bosentan, 32 controls. Following cardiac surgery, these patients died in-hospital (bosentan 6 controls; 6%, p=0.039). The primary endpoint of peakVO2 six weeks postoperatively did not differ between the bosentan (21.7±7.7 mg/kg/min) and control group (22.0±7.6 mg/kg/min; p=0.520). The secondary endpoints were comparable as well. However, subgroup analyses showed a significantly higher TAPSE six weeks postoperatively in patients with symptoms (NYHA≥2), high pulmonary pressures, or low preoperative right ventricular function (RVF) who received bosentan therapy.

Conclusion: Our results do not support routine use of bosentan in adult CHD patients undergoing cardiac surgery. However, in patients with symptoms, pulmonary arterial hypertension or impaired RVF, bosentan may improve RVF postoperatively.

Keywords: congenital heart disease; cardiac surgery; bosentan

EFFECT OF VALSARTAN ON 10-YEAR SURVIVAL AND CLINICAL EVENTS IN PATIENTS WITH A SYSTEMIC RIGHT VENTRICLE

A.C. van Dissel; H.W. Vlegge; P.G. Pies; A.P.J. van Dijk; G.T. Steenwier; J.W. Roos-Hesselink; B.J.M. Mulder; B.J. Bouma (Academic Medical Center Amsterdam)

ABSTRACT

Purpose: Treatment with ACE-inhibitors for 3 years improves survival in patients with left ventricular failure beyond the original trial period. To establish the long-term effects of valsartan on survival and clinical events in patients with a systemic right ventricle, we extended follow-up on the in 2006-initiated Dutch randomized, placebo-controlled trial of patients with transposition of the great arteries (TGA).

Methods: Of the 86 survivors at the end of the 3-year trial period, data on vital status and clinical events were collected through linkage with the national mortality registry and patient records. Clinical events comprised (supra)ventricular arrhythmia, worsening of heart failure, tricuspid valve surgery and death. Analysis was done on an intention-to-treat basis according to the original randomization groups.

Results: At 10 years, overall survival was 90% and did not differ between the valsartan and placebo group with 3 deaths occurring in each of the treatment arms. Patients originally assigned to valsartan had a significantly lower risk of developing a clinical event: at 10 years, 34% remained event-free in the valsartan group versus none in the placebo group (p=0.012; Figure 1). In particular, the subgroup of patients symptomatic at baseline (NYHA≥2) experienced a lower risk for clinical events after valsartan treatment as compared to placebo (p=0.012).

Conclusion: Upon 10-year follow-up, treatment with valsartan for 3 years showed no survival benefit as compared to placebo. However, valsartan treatment led to a significant reduction in development of clinical events particularly in symptomatic patients. Treatment with valsartan should be considered in all TGA patients.

Keywords: transplantation of the great arteries; valsartan; long-term follow-up

Figure 1. Kaplan-Meier curves presenting the event-free survival (primary endpoint) and the heart failure-free survival (secondary endpoint), stratified according to GDF-15 quartiles.
HOW TO MAKE CARDIAC REFERRALS BY GP’S MORE EFFICIENT AND PROMOTE A PATIENT AND PHYSICIAN FRIENDLY APPROACH IN NONCOMPLEX CARDIAC PATHOLOGY (NCP)

P.N. Breuls; A. Evertse; E. Los; J. Caljouw (Stichting Koel, Zwijndrecht)
nbreuls@gmail.com

ABSTRACT

Purpose:
To reduce inappropriate cardiac referrals (ICR) by General Practitioners (GP’s) to outpatient cardiac clinics (OCC) by introducing direct positioning of a cardiologist next to GP’s in primary care and hence reduce health care costs and improving a patient and GP friendly environment without loss of quality of care.

Methods:
50 GP’s (IG) were trained in 4 referral indications (RI): chest pain (CP), heart failure (HF), arrhythmias (AR) and murmurs (M). Protocols of the Dutch GP Society in these RI were adjusted. In each step a primary care cardiologist (PCC) could be consulted by mail, medical apps, phone or during consultation at office GP or patient home. 20 GP’s were contacted and considered as controls (CG) who continued their standard approach of medical care.

Results:
There were 958 patients (IG), vs 404 (CG). There was a reduction of referrals of NCP’s of 65 % without complications which was associated with great appreciation by patients and GP’s. costs reduction is at least €135,000 per 1000 patients. There were no reported complications.

Conclusion:
Treatment and follow up of NCP by GP’s under close supervision of a PCC reduces ICR’s to OCC by 65% without the loss of quality and reduces costs of public health.

Keywords:
primary care cardiology; costs reduction; patient appreciation

Table 1. The table shows a reduction of referrals by the IG vs CG, with an increase of cardiac tests on the other hand.

<table>
<thead>
<tr>
<th></th>
<th>IG</th>
<th></th>
<th>CG</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Total referrals to outpatient clinic</td>
<td>182</td>
<td>20.4%</td>
<td>233</td>
<td>27.6%</td>
</tr>
<tr>
<td>Total additional tests (of patient visits)</td>
<td>861</td>
<td>96%</td>
<td>241</td>
<td>29%</td>
</tr>
</tbody>
</table>