

016 YOUNG PATIENTS WITH HEART FAILURE OFTEN DO NOT HAVE MAJOR ECG ABNORMALITIES

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Background It is commonly held that a normal ECG rules out the diagnosis of heart failure¹; however this has only been demonstrated in the elderly.² Do young people with heart failure always have major ECG abnormalities?

Aim To determine the proportion of patients aged below 65 who had heart failure with LVSD who present with ECGs without major abnormalities.

Methods 100 consecutive admissions to the Scottish National Advanced Heart Failure Service at the Golden Jubilee National Hospital, Glasgow who were aged below 65 and had an echocardiogram and ECG available. Ejection fraction was quantified using the Simpson's biplane method. ECGs were independently assessed by two cardiologists blinded to the result of the echocardiograms. Any disagreements were resolved by a third cardiologist. Majorly abnormal ECGs contained ≥ 1 of: Q-waves, left ventricular hypertrophy (LVH), bundle branch block and atrial fibrillation. Presence of Q waves was assessed subjectively by the two assessors and then using criteria as defined by the Universal Definition of Myocardial Infarction by a third assessor. Similarly the presence of LVH was assessed subjectively and using the Sokolow-Lyon Index. Minor abnormalities of ECG included atrial enlargement, bradycardia, tachycardia, broadening of QRS complex, poor R wave progression, left or right axis deviation, myocardial ischaemia, first degree atrioventricular block, and non-specific ST-T wave changes.

Results Of 100 consecutive patients, 77 were males and 23 females. Mean age was 50 years (range 18–64). 76 had major ECG abnormalities. 22 had only minor ECG abnormalities and no major ECG abnormalities; two had no abnormalities. All patient groups had marked LV systolic dysfunction (ejection fractions of $28.6\% \pm 2.8$, $28.4\% \pm 3.4$, $25.5\% \pm 6.9$ for those with major, minor and no abnormalities on ECG respectively). Analysis by criteria for Q waves demonstrated 71 had major ECG abnormalities, 27 had minor ECG abnormalities and 2 had none. Analysis by criteria for LVH gave the same results as the initial cardiological analysis.

Conclusion Only 71%–76% of patients under the age of 65 have major ECG abnormalities, compared to 98% of patients of any age (2). Young patients with heart failure often have minor ECG abnormalities in the absence of major ECG abnormalities. The index of suspicion of heart failure in young symptomatic patients should be high even in the absence of major ECG.

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017 MICROVOLT T-WAVE ALTERNANS (MTWA) TESTING IN "REAL WORLD" HEART FAILURE (HF): A STUDY OF PREVALENCE AND INCREMENTAL PROGNOSTIC VALUE

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Glasgow, UK; ³Glasgow Royal Infirmary, Glasgow, UK; ⁴Robertson Centre for Biostatistics, University of Glasgow, Glasgow, UK; ⁵Scottish National Advanced Heart Failure Service, Golden Jubilee National Hospital, Glasgow, UK

Background Ventricular arrhythmias contribute to the high risk of death in heart failure (HF) and can be treated with an implantable cardioverter-defibrillator (ICD). Microvolt T-wave alternans (MTWA) testing examines beat-to-beat fluctuations in the morphology of the T-wave. Alternans is believed to reflect dynamic instability of repolarisation and to be linked, mechanistically, to ventricular arrhythmias. Observational studies in highly selected populations have suggested that MTWA testing may identify individuals likely to benefit from a primary prevention ICD. The aims of this study were to evaluate the applicability of MTWA testing in an unselected cohort of patients recently hospitalised with HF and determine the prevalence and incremental prognostic value of an abnormal test.

Methods Consecutive admissions with confirmed HF (typical clinical findings and BNP > 100 pg/ml) were recruited in three hospitals from 1 December 2006 to 12 January 2009. Survivors were invited to attend 1-month post-discharge for MTWA testing (HearTWave II, Cambridge Heart).

Results 648 of 1003 patients recruited returned for MTWA testing (58% males, mean age 70.8 years). 318 patients (49%) were ineligible for MTWA testing due to atrial fibrillation (AF), pacemaker-dependency or inability to exercise. Of the 330 patients who underwent MTWA treadmill testing, 100 (30%) were positive, 78 (24%) were negative and 152 (46%) were indeterminate. Failure to achieve the target heart rate due to chronotropic incompetence, secondary to β -blocker therapy or physical limitations, accounted for 75% of indeterminate tests. 131 deaths occurred during a mean follow-up of 18 months. 23% of ineligible patients died vs 17% of eligible patients. 12%, 20% and 19% of patients with a positive, negative and indeterminate test, respectively, died ($p=0.24$). MTWA results were analysed in the accepted way of non-negative (positive and indeterminate) and negative, but there was still no difference in mortality between the groups ($p=0.39$). MTWA showed no incremental prognostic value in a multivariable mortality model. The independent predictors of mortality were: lower body mass index (HR 0.96 [95% CI 0.93 to 0.99], $p=0.01$), New York Heart Association class III–IV (1.72 [95% CI 1.2 to 2.47], $p=0.003$), previous myocardial infarction (1.68 [95% CI 1.18 to 2.4], $p=0.004$), elevated B-type natriuretic peptide concentration (1.36 [95% CI 1.12 to 1.65], $p=0.002$) and elevated troponin (1.57 [95% CI 1.04 to 2.37], $p=0.03$).

Conclusion MTWA treadmill-testing was not widely applicable in typical patients with HF and failed to predict mortality risk. At present MTWA cannot be endorsed as a tool for improving risk stratification in HF.

018 THE BREAST CANCER, EARLY DISEASE: TOXICITY FROM THERAPY WITH EPIRUBICIN REGIMENS 'C' CARDIAC ASSESSMENT AND RISK EVALUATION (BETTER-CARE), CARDIOVASCULAR MAGNETIC RESONANCE (CMR) SUB-STUDY: CYCLE 1 CHANGES PREDICT LATE ANTHRACYCLINE CARDIOTOXICITY

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Introduction A growing number of patients are at risk from chronic anthracycline cardiotoxicity (cAC) as a result of improving prognosis of cancer. This is true even at low, adjuvant doses. In breast

Abstract 018 Table 1

Variable	Mean (SD) Baseline	Mean (SD) Day 3	Mean (SD) Follow-up	Change (95% CI), p Day 3-Baseline	Change (95% CI), p Follow-up-Baseline
LVEF %	72.7 (4.7)	71.6 (4.2)	70.1 (5.2)	-1.1 (-2.440 to 0.16) p=0.09	-2.6 (-3.97 to -1.36) p=0.0002
LV Mass g/m ²	105.6 (12.3)	109.1 (12.9)	104.2 (13.8)	3.5 (1.98 to 4.55), p=0.00004	-1.4 (-3.03 to -1.02), p=0.31
RVEF %	67.9 (5.4)	67.5 (5.8)	66.5 (5.3)	-0.4 (-1.71 to 0.85) p=0.5	-1.4 (-2.41 to -0.43) p=0.006
ERGE	2.36 (0.8)	2.74 (1.1)	NA	0.37 (0.13 to 0.62) p=0.003	NA
STIR	63.3 (19.8)	67.1 (20.0)	NA	3.8 (-0.35 to 8.02) p=0.07	NA

cancer, Herceptin use increases this risk. Susceptibility is highly idiosyncratic. Although detection of cardiomyocyte injury using endomyocardial biopsy is the gold standard, it is not appropriate for routine monitoring. Serial measurements of LV ejection fraction (LVEF) only detect cardiotoxicity after significant damage has been incurred. Cardiovascular magnetic resonance (CMR) can detect myocardial inflammation and oedema using STIR (Short TI Inversion Recovery) and early gadolinium relative enhancement (EGRE). We hypothesised these CMR sequences could be used as non-invasive tests to assess acute injury and predict cAC.

Methods Patients receiving adjuvant chemotherapy for early breast cancer, were scanned before and 3 days after their first cycle of epirubicin. Follow-up CMR was performed >1 year after the final dose of anthracycline, or >3 months after the end of Herceptin. Cine imaging was used to measure LVEF; STIR and EGRE images were obtained to assess cardiac inflammation.

Results 51 patients completed the protocol. Changes in CMR parameters are outlined in the Abstract 018 table 1 below. In patients with a $\geq 5\%$ decrease in LVEF (n=22) at follow-up, the day 3 mean EGRE increased by 32% (p=0.002) and mean STIR SI increased by 15% (p=0.003). In the remaining patients (n=29) there were no significant changes in EGRE or STIR.

Conclusions/Implications This study has shown that subclinical myocarditis occurring after the first exposure to anthracycline can be detected using CMR and is associated with late falls in LVEF. Thus potentially identifying those at increased risk of premature heart failure, before the majority of damage is caused. Recognition of this susceptibility could inform treatment decisions and/or identify those requiring greater cardiac surveillance.

019 DEVELOPMENT AND VALIDATION OF A NOVEL PRESSURE-ONLY INTRA-CORONARY INDEX OF CORONARY STENOSIS SEVERITY

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Background Assessment of stenosis severity with fractional flow reserve (FFR) requires that coronary resistance is stable and minimised. This is usually achieved by administration of pharmacological agents such as adenosine, which adds to the cost of the procedure and cannot be administered to all patients. In this study we determine (1) if there is a time when resistance is naturally minimised at rest and (2) assess the diagnostic efficiency, compared to FFR, of a new pressure-derived adenosine-free index of stenosis severity over that time.

Methods 157 stenoses were assessed. In part 1 (39 stenoses), intracoronary pressure and flow-velocity were measured distal to the stenosis; in part 2 (118 stenoses), intracoronary pressure alone was measured. Measurements were made at baseline and under pharmacological vasodilatation with adenosine.

Results Wave intensity analysis identified a wave-free period where intracoronary resistance at rest is similar in variability and magnitude (coefficient of variation: 0.08 ± 0.06 and 284 ± 147 mm Hg.s/m) to those during FFR (coefficient of variation: 0.08 ± 0.06 and 302 ± 315 mm Hg.s/m, p=NS for both). The resting distal to proximal pressure ratio during this period, the instantaneous wave-Free Ratio (iFR), correlated closely with FFR (r=0.9, p<0.001) with excellent diagnostic efficiency (receiver operating characteristic area under curve of 93%, at FFR<0.8), specificity, sensitivity, negative and positive predictive values of 91%, 85%, 85% and 91%, respectively.

Conclusion Intra-coronary resistance is naturally constant and minimised during a diastolic wave-free period. The instantaneous wave-Free Ratio calculated over this period produces a drug-free index of stenosis severity comparable to FFR. Adoption of instantaneous wave-Free Ratio would enable the benefits of physiologically guided angioplasty to be applicable to a larger patient population.

020 COMPARISON OF FRACTIONAL FLOW RESERVE MEASUREMENTS OBTAINED USING CENTRAL VS DISTAL PERIPHERAL INTRAVENOUS ADENOSINE INFUSION TO INDUCE HYPERAEMIA

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Introduction Measurement of fractional flow reserve (FFR) permits physiological evaluation of coronary lesions. Maximal hyperaemia is required and adenosine is most often used for this. The gold standard method is continuous adenosine infusion via a large central (usually femoral) vein. Use of radial access for coronary angiography is now used in over 50% of cases performed in the UK. Hence it is desirable to have an alternative route for adenosine delivery. Peripheral venous access is frequently obtained in the hand, since veins are often most readily accessible here. However concerns exist as to whether delivery from this site would achieve adequate vasodilatation. Our aim was to address this question.

Methods Ethical approval and informed consent was obtained. Subjects were selected from patients attending for coronary angiography who were deemed to need a pressure wire to assess an intermediate coronary stenosis. Subjects received intravenous adenosine infusion sequentially by two routes: first, via a 20G hand cannula, and then, after a washout period, via a 6F femoral venous sheath. Adenosine was administered at $140 \mu\text{g/kg/min}$ for each site. Data interpretation was performed in a blinded manner. Baseline values of FFR were recorded, as was the minimal FFR achieved with adenosine infusion, from each infusion site. Time to peak hyperaemia was also recorded separately for each infusion site.

Results 37 coronary artery lesions were evaluated in 23 patients. For the overall group, FFR using hand vein adenosine infusion was 0.86 ± 0.09 ; FFR using femoral vein adenosine infusion was 0.85 ± 0.09 . Individual paired comparisons of FFR readings using the different routes of adenosine administration are shown in Abstract 020