



**British Society of Cardiovascular Imaging / British Society of Cardiovascular CT**

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## **POSTER ABSTRACTS**

- Poster abstracts will be published as a supplement in Heart and will be available online on the 5<sup>th</sup> of May at <http://heart.bmj.com/content/supplemental>
- Posters marked with (P) have been selected for oral presentation on Friday 6<sup>th</sup> May

# **Appropriate use of down-stream invasive coronary angiography (ICA) following computed tomographic coronary angiography (CTCA) is still a work in progress**

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## **Introduction**

There is little difference between CTCA and ICA in the ability to predict ICA fractional flow reserve (FFR) positive stenosis and ICA should follow CTCA to facilitate revascularisation not to 'check' CTCA results. This audit determined the proportion of patients having no treatment change (NTC) when ICA followed CTCA in Plymouth Hospitals NHS Trust (PHNT).

## **Methods**

A retrospective single site audit identified 292 patients who had both diagnostic quality CTCA and subsequent ICA for the same patient episode between 2013 and 2014. Significant coronary artery disease (CAD) was defined as > 50% stenosis ( $\geq$ moderate) and ICA was used as the reference standard (deferring to FFR if available). Patients were classified according to whether revascularisation followed ICA, or NTC resulted in which case we identified a main factor why.

## **Results**

There was 89% agreement between CTCA and invasive testing. 27/292 (9.25%) patients had CTCA considered false positive and 5/292 (1.71%) false negative (FN) after ICA +/- FFR (33/292 FFR, 11.30%). Most patients were revascularised 168/292 (57.53%, PCI 119/292, (40.75%), CABG 49/292 (16.78%)) with the CTCA report suggesting revascularisation in 157/292 (53.77%). NTC group consisted of 124/292 (42.47%) patients. 53/292 (18.15%) treated with medical therapy, 64/292 (21.92%) had atypical symptoms, 5/292 (1.71%) had complex comorbidities and 2/292 (0.68%) had other reasons.

## **Conclusion**

CTCA accuracy was high. However 42% of patients undergoing ICA following CTCA have NTC resulting. A positive CTCA result should therefore prompt consideration of clinical consultation, functional imaging or ICA rather than direct ICA.

## **Cardiac CT: Predictor of Revascularisation**

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### **Introduction**

2010 NICE guidelines recommend cardiac CT in patients with stable chest pain and likelihood of coronary artery disease of 10-29%. We determined use of correlative imaging to assess for coronary artery disease and subsequent revascularisation.

### **Methods**

All patients who underwent cardiac CT for chest pain assessment between September 2011 and March 2013 were identified. Those with evidence of previous revascularisation were excluded. Presence and severity of reported coronary disease was documented. Correlative cardiac imaging and revascularisation were identified from electronic patient records.

### **Results**

Of 552 chest pain patients referred for cardiac CT, 293 had calcium scoring only (CTCS), 211 had CTCS and CT Coronary Angiogram (CTCA) and 48 had CTCA only. 49 patients underwent subsequent invasive angiography (IA) (8.9% patients). 14 of those were revascularised (2.5% all patients), all with abnormal CTs: 2 had CABG and 12 percutaneous coronary intervention. Of the 35 patients not revascularised, 5 had normal CTCA and IA, 24 had positive CT and negative IA, 6 had both positive. Of the patients undergoing IA, 4 of 28 (14.3%) with a calcium score <400 were revascularised compared with 9 of the 17 (52.3%) with a calcium score >400.

### **Conclusions**

2.5% of patients referred for cardiac CT to investigate chest pain without prior interventional treatment undergo revascularisation. Revascularisation rates in patients with a positive CTCA and a calcium score of <400 were only 14.3% compared with 52.3% in those with scores of >400. This suggests a score <400 may help reduce unnecessary IA.

## **Detecting hypertensive heart disease: the additive value of cardiovascular magnetic resonance imaging (P)**

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### **Introduction**

International hypertension guidelines advise screening for hypertensive heart disease (HHD) to aid risk stratification. Cardiac magnetic resonance (CMR) is the current non-invasive gold-standard for assessing ventricular structure/function. We aimed to determine the additive value of CMR in hypertensives over echocardiography.

### **Methods**

85 subjects (60% men, office systolic BP: 165±28mmHg, office diastolic BP: 94±14mmHg) from our tertiary hypertension clinic with preceding echo underwent 1.5T CMR. Left ventricular mass and volumes were estimated from short-axis steady-state free precession cines. LVH was defined on the basis of echo and CMR normal reference ranges. The presence and pattern of myocardial late gadolinium enhancement (LGE) was documented.

### **Results**

Overall, there was no difference in prevalence of LVH by echo compared to CMR (68% vs 66%,  $P = 0.746$ ). However, there was a discrepancy between echo and CMR in 28%. Relative to CMR gold-standard, echo over-diagnosed LVH in 15% and missed LVH in 13%. The diagnostic performance of echo at detecting LVH was as follows: specificity 55%, sensitivity 80%, positive predictive value 78%, negative predictive value 59% and overall accuracy 72%. Ischaemic LGE was present in 7% of subjects and non-ischaemic LGE was present in 9%.

### **Conclusion**

Echocardiography over-diagnosed and under-diagnosed LVH in an important minority of patients. LGE tissue characterization is unique to CMR and identified ischaemic and non-ischaemic myocardial fibrosis is an important minority of hypertensives. Our findings support an extended role of CMR in hypertension where documenting in the presence/absence of HHD may have clinical management implications.

# **Diagnostic performance of myocardial blood flow quantification in coronary artery disease by magnetic resonance .(P)**

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## **Background**

Mathematical modeling of magnetic resonance (MR) perfusion imaging data allows myocardial blood flow (MBF) quantification and can potentially improve the diagnosis and prognostication of obstructive coronary artery disease (CAD). The diagnostic performance of distributed parameter (DP) modeling in detecting obstructive CAD has not yet been assessed. A model assessment in per vessel against per patient analysis has not been fully assessed yet in a single MR study. This work compares the diagnostic performance of DP modeling against the standard Fermi modeling, for the detection of obstructive CAD, in per vessel against per patient analysis.

## **Methods**

After informed consent, a pilot cohort of 28 subjects with known or suspected CAD underwent adenosine stress-rest magnetic resonance perfusion imaging at 3T. Data were analysed using Fermi and DP modeling against invasive coronary angiography and fractional flow reserve, acquired in all subjects. Obstructive CAD was defined as luminal stenosis of  $\geq 70\%$  alone, or luminal stenosis  $\geq 50\%$  and fractional flow reserve  $\leq 0.80$ .

## **Results**

On ROC analysis, the diagnostic performance of all methods was improved in per patient analysis. DP modeling outperformed the standard Fermi model, in per vessel and per patient analysis. In per patient analysis, DP modeling-derived MBF at stress demonstrated the highest sensitivity and specificity (0.96, 0.92) in detecting obstructive CAD, against Fermi modeling (0.78, 0.88) and visual assessments (0.79, 0.88), respectively.

## **Conclusions**

DP modeling consistently outperformed Fermi modeling and showed that it may have merit for robustly stratifying patients with at least one vessel with obstructive CAD.

# **Non-invasive stress imaging as a gatekeeper to complete revascularisation in STEMI patients with moderate bystander disease at primary percutaneous coronary intervention**

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## **Introduction**

40% of patients presenting with STEMI have multivessel disease (MVD). Current international guidelines recommend revascularization of the culprit artery only. However recent trials (PRAMI/CVLPRIT) have shown a superiority of complete in-hospital revascularisation. Objective: Assess the role of non-invasive stress imaging as a gatekeeper to complete revascularisation in STEMI patients with moderate bystander disease.

## **Methods**

A registry study of consecutive patients who underwent Primary Percutaneous Coronary Intervention (P-PCI) of the culprit artery. Significant MVD was defined as non-culprit stenosis  $\geq 50\%$  in large proximal epicardial vessel, or  $\geq 75\%$  elsewhere (moderate if 50-74% stenosis in large proximal epicardial vessel, or 75-94% elsewhere). Non-invasive stress imaging was performed at 4 weeks. Patients with severe or critical bystander disease were excluded from the study. A simple cost analysis model was built for UK and USA.

## **Results**

1,167 patients were included (74% males, 64 years), 33% demonstrating MVD. 40% of MVD underwent stress CMR, and 36% a stress echocardiogram. The remaining 93 patients underwent direct revascularisation or were lost to follow up. Only 47% had evidence of inducible myocardial ischaemia in moderate bystander coronary artery disease (61/157 in stress CMR and 78/141 in stress echocardiogram). When PCI in MVD is performed only in the presence of inducible myocardial ischemia, there is saving. (UK or US).

## **Conclusions**

<50% patients with moderate MVD at PPCI have inducible myocardial ischemia in the moderate bystander disease. Non-invasive stress imaging as a gatekeeper to complete revascularisation, may potentially reduce the number of PCIs, also resulting in a cheaper management strategy.

# **Myocardial infarction & viability assessment by 12 lead ECG vs gold standard cardiac magnetic resonance (P)**

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## **Introduction**

Q-waves on 12 lead ECG is considered a marker of transmural myocardial infarction (MI) and is used universally. Late gadolinium enhancement (LGE) cardiovascular magnetic resonance (CMR) accurately identifies MI and has become the gold standard for the assessment of myocardial viability. Aim: Determine the diagnostic accuracy of Q-waves to identify MI and predict regionality. Ascertain the CMR predictors of Q-wave.

## **Methods**

Data collected on 498 consecutive patients (mean age 64 years, 71% males) referred for CMR with suspected IHD. Patients with non-IHD were excluded. Q waves in  $\geq 2$  precordial leads from V1-V4 reflected LAD territory. Transmural infarction was defined as  $>50\%$  LGE.

## **Results**

290 patients demonstrated MI, 157 transmural and 133 sub-endocardial based on LGE. Diagnostic accuracy of Q-wave as a marker of transmural MI was 66% and as a predictor of previous MI was 55%. 126 had pathological Q-waves, 40% in LAD territory, 55% non-LAD and 5% a combination. Of those with anterior (LAD) Q waves, 68% demonstrated LAD territory LGE and in non-LAD Q waves, 67% demonstrated a non-LAD territory infarct by LGE. On multivariate analysis, total scar score and  $>75\%$  thickness LGE were significant predictors of Q wave.

## **Conclusion**

Presence of pathological ECG Q-waves is not only a poor marker of myocardial scarring, but also a poor predictor of viability and regionality when compared to CMR. Presence of Q wave correlates only with total scar score and  $>75\%$  LGE. In clinical decision-making, clinicians need to be aware of the limitations of ECG Q-waves.

# **Multi-modal imaging of anomalous left coronary artery off the pulmonary artery (ALCAPA)**

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## **Introduction**

Although first described in 1866, ALCAPA was recognised with a clinical description and correlation with autopsy findings by Bland and colleagues in 1933. ALCAPA accounts for approximately 0.25-0.5% of all congenital heart defects and exists predominantly in two forms; infant type and adult type. Infants present with features of myocardial ischaemia and heart failure and very rarely can be associated with other cardiac anomalies. Mortality rate approaches 90% in infants if ALCAPA is left untreated. Adult cases are unusual and but can present with unusual ischaemic symptoms. Although historically ALCAPA was diagnosed at conventional angiography, the development of gated CT and MRI imaging allows assessment with non-invasive means. Learning Objectives: To describe and illustrate radiological findings and characteristics in patients diagnosed with having an ALCAPA anomaly.

## **Imaging Findings**

We describe our case series of patients with characteristic findings on electrocardiography, CT and MRI seen in patients with ALCAPA. The left coronary artery arises from the pulmonary trunk and branches into dilated LAD and circumflex vessels. Collaterals are usually seen between the right and left coronary arteries with retrograde flow through the left coronary artery into the pulmonary trunk. The right coronary artery is often also dilated due to high volume flow. Identification of these dilated collaterals is often the first indication of this pathology.

## **Conclusion**

It is important for radiologists to be aware of the typical imaging findings in this relatively rare anomaly as prognosis is good with early diagnosis and surgical correction.

# **Comparison of weight-based vs estimated contrast dose techniques in coronary computed tomography angiography**

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## **Introduction**

The purpose of this study was to compare weight based versus estimated contrast dosing techniques in coronary computed tomography angiography (CCTA).

## **Methods**

This single centre retrospective observational study compared 47 patients undergoing CCTA. All imaging was performed on a 320 slice scanner at 100kV with bolus tracking. In the weight based protocol, patients received 22mg/kg/s of contrast for 14 seconds. In the estimated group, contrast dosing and rate was estimated by a consultant cardiac radiologist. Two tailed t tests determined significance between patient and contrast variables. Enhancement of cardiac chambers and coronary arteries was calculated through region of interest areas in Hounsfield units (HUs).

## **Results**

There were no significant differences between the groups in terms of mean weight ( $p=0.42$ ) or mean heart rate ( $p=0.29$ ). The estimated group received a significantly higher volume of contrast than the weight based group (71mls vs 58mls,  $p<0.001$ ). There was a non-significant difference between groups in MEV of coronaries. Both groups produced diagnostic MEVs above 400 HUs. Right sided chambers were attenuated significantly more in the best guess than the weight based group, for example right ventricle MEV 279 vs 141 ( $p=0.01$ ). SDs in coronary arteries were similar between groups but weight based contrast protocol achieved lower standard deviation of HUs on the right sided chambers.

## **Conclusion**

Weight based and estimated contrast regimes produce similar variability and adequate opacification in coronary arteries in CCTA. However, weight adjusted contrast dosing technique administers a lower dose of contrast, with lower enhancement of the right sided chambers.

## **Incidental Findings in CTCA**

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### **Background**

CT coronary angiograms have been performed at the Golden Jubilee National Hospital since 2004 and with the installation of the GE 750 HD scanner in 2010, a cardiologist led service for CTCA was set up. To comply with BSCI guidelines, the non-contrast calcium score was reconstructed to provide a larger field of view for radiologists to report non-cardiac elements of the scans. After discussion with the lead radiologist, a decision was made to split both non-contrast and contrast series and retrospectively reconstruct them into larger display field of view to allow radiologists to report the non-cardiac elements from both series. This audit was carried out to investigate the number of incidental radiological findings reported on CTCA scan and their clinical significance.

### **Method**

Data was collected retrospectively from the non-cardiac section of reports generated from CTCA scans performed between February-July 2015 inclusive. Any incidental findings were noted and recorded.

### **Results**

407 CTCA scans were performed between February-July 2015, within this group of 173 patient scans, 42%, were reported with incidental findings. Most significantly within this cohort, 4 patients (2%) required immediate treatment for pulmonary embolus. 2 patients (1%) required urgent referral for suspicious chest mass. 2 patients (1%) required 3-4 month CT follow up for chest mass.

### **Conclusion**

A large proportion of patients scanned were reported with incidental findings in the chest/upper abdominal area. The majority were benign, requiring no urgent follow up. However a small percentage was reported to have significant clinical findings which required urgent or immediate referral/treatment. Therefore the audit has demonstrated the importance of reconstructing both pre and post contrast large field of view images in order to visualise pathology which may be hard to distinguish in the non contrast phase. The audit has also highlighted the importance of a multi-disciplinary approach when reporting both cardiac and non-cardiac elements of the CTCA scan.

## **Insights into hypertensive heart disease phenotypes: spectrum of myocyte, interstitial and vascular changes by cardiovascular MRI. (P)**

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### **Introduction**

Hypertensive heart disease (HHD) can be classified into 4 left ventricular (LV) phenotypes: 1) normal, 2) concentric LV remodeling (LVr), 3) concentric LV hypertrophy (cLVH) and 4) eccentric LV hypertrophy (eLVH). The pathophysiology of the phenotypes is incompletely understood. We investigate extent of myocardial interstitial fibrosis and aortic impairment in HHD with cardiovascular magnetic resonance (CMR)

### **Methods**

88 hypertensives (49±14yrs, 57% male, SBP: 167±30mmHg, DBP: 96±14mmHg) underwent CMR (1.5T) and were compared with 29 age- and sex-matched normotensive controls (47±14years, 59% male, SBP: 128±12mmHg, DBP: 79±10mmHg). Native T1 and extra-cellular volume fraction were measured. Circumferential myocardial strain was calculated by voxel-tracking. Aortic compliance was recorded.

### **Results**

At a structural level, increased LV mass in eccentric and concentric LVH resulted from: i) significantly increased myocardial cell volume (eLVH: 78±19g/m<sup>2</sup> vs cLVH: 73±15g/m<sup>2</sup> vs LVr: 55±9g/m<sup>2</sup> respectively, P<0.05) and ii) significantly increased interstitial volume (eLVH: 33±10g/m<sup>2</sup> vs cLVH: 30±10g/m<sup>2</sup> vs LVr: 19±2g/m<sup>2</sup> respectively, P<0.05). Functionally, eccentric and concentric LVH were associated with significantly impaired circumferential strain (eLVH: -12.8±4.6% vs cLVH: -15.5±3.1% vs LVr: -17.1±3.2% vs controls: -17.4±2.6% respectively,

P<0.05). Despite similar BP severity as LVH phenotypes, LV remodeling was associated with reduced aortic compliance but not associated with interstitial fibrosis or myocardial dysfunction relative to controls.

### **Conclusion**

Myocardial interstitial fibrosis varies across HHD phenotypes with functional consequences. Eccentric LVH demonstrated the most interstitial fibrosis and systolic strain impairment. LV remodeling had normal myocardial, but abnormal aortic, function. Greater understanding of the pathophysiology of HHD phenotypes may help tailor future treatments.

# Real-World Evidence of the Safety of Pharmacologic Stress in Myocardial Perfusion Imaging

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## Introduction

Myocardial perfusion imaging (MPI) is increasingly used as recommended by NICE for patients with a 30–60% estimated likelihood of coronary artery disease. We aimed to investigate the safety of drugs used in patients undergoing pharmacologic stress MPI.

## Methods

A 9-month (May 2015 – Feb 2016) retrospective study to investigate the incidence of adverse effects (AE) in patients undergoing pharmacologic stress MPI. We employ standardized protocols (Tc-99m) using 4 agents: dipyridamole, regadenoson, adenosine and dobutamine. Clinical data including AEs were collected from cardiobase. Descriptive analysis and frequencies were calculated. AE in MPI were compared to those occurring in 50 patients who underwent conventional exercise tolerance testing (ETT) using chi-squared test.

## Findings

Of the 360 patients (mean age 67 years [SD 11]; 196 men, 164 women), who had pharmacologic stress agent administered, 166 (46%) became symptomatic: dyspnoea (24.7%), chest discomfort (12.8%), flushing (10%), chest pain (3.6%), cough (3.3%), nausea (2.8%), pain elsewhere (2.5%), dizziness (2.5%), vasovagal reaction (2.2%), wheeze (1.9%), headache (1.9%), vomiting (0.8%), abdominal discomfort (0.8%). The commonest symptom was chest discomfort for dobutamine but dyspnoea for all the other agents. Adenosine had the highest incidence of AE (76%). No significant complications were recorded that required hospital admission. When compared with ETT there was no significant difference of adverse effects (MPI 166/360 [44%], ETT 29/50 [58%];  $p=0.12$ ).

## Conclusions

This real-world data show that pharmacologic stress MPI is safe when clinical protocols are followed. Technician (physicist)-led testing could be an alternative in busy cardiac units where medical staffing are not always available.

# **Role of Coronary Computed tomography angiography (CTA) in chest pain evaluation in females**

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## **Introduction**

Coronary computed tomography angiography (CTA) has a high negative predictive value for excluding significant coronary artery disease (CAD) with those with <50% luminal stenosis not requiring further investigation. Those with >50% stenoses require further non-invasive or invasive evaluation. Current NICE guidelines recommend CT calcium scoring as first-line investigation in patients with chest pain and an estimated likelihood of CAD of 10-29%. In females this includes those under 65 at low risk with atypical angina. The aim of this study was to evaluate coronary CTA as a single imaging modality to rule out significant CAD in females.

## **Methods**

We retrospectively assessed the coronary CTA findings of all female patients presenting with chest pain and undergoing assessment for possible underlying CAD at Bradford Royal Infirmary from January 2013 to December 2014. Patients were grouped according to age and this was assessed against the presence or absence of significant atheroma (>50% luminal stenosis).

## **Results**

462 female patients underwent Coronary CTA with a median age of 57 (range 31-82). Coronary CTA was able to rule out significant CAD in a high proportion of all age ranges but became less sensitive with advancing age. Those with a stenosis of greater than 50% required further evaluation. Exclusion of significant CAD varied from 90% for females aged 30-49 to 87% in those aged 50-69 and remained as high as 78% for those over 70.

## **Conclusion**

Coronary CTA provides an effective single modality evaluation for chest pain in females including those over 65 years of age.

# **Pre renal transplant cardiac risk stratification - clinical risk score to aid triage of patients prior to non-invasive or invasive evaluation.**

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## **Introduction**

Stress myocardial perfusion imaging (MPI) is recommended to risk stratify patients undergoing renal transplantation. Patients with positive MPI studies are likely to need further invasive angiography. The aim of this study was to create a novel clinical risk score (CRS) to help triage patients to a single modality of non-invasive or invasive assessment prior to transplantation.

## **Method**

A review of the risk factor profile of 39 patients undergoing stress MPI prior to renal transplantation was undertaken. The CRS was developed as follows (one point if present): Age >65; BMI >30; Smoking history; Hypertension; Diabetes; Vascular history. The CRS was applied to patients and compared with the outcome of the MPI.

## **Results**

20 male and 19 female patients were identified. 4 patients were excluded (incomplete data). 5 patients had positive MPI studies. The characteristics of patients with positive and negative MPI is in Table 1. The patient with a CRS score of zero had a negative MPI. 7.2% (2/28) of patients with a CRS of 1-3 had a positive stress MPI compared with 50% (3/6) in those with a CRS of 4 or greater. These patients required additional evaluation after MPI.

## **Conclusion**

1. Patients with CRS of zero may not need non-invasive assessment prior to renal transplant.
2. Patients with a CRS of 1-3 are best assessed by non-invasive stress imaging initially.
3. In patients with CRS of 4 and greater, invasive angiography may be more appropriate as the single investigative modality.
4. Larger studies are needed to validate these findings.

## **Primary care direct access Coronary Artery Calcium (CAC) Score – prognosis from a novel service. (P)**

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### **Introduction**

“NICE guidelines 95: Chest pain of recent onset” states that in a clinically low risk patient, negative CAC study alone excludes obstructive coronary disease. We describe a novel service which allows primary care direct access referral for CT CAC, established at UHB in 2011. Our study aims to evaluate the prognostic value of a negative CT CAC within our centre.

### **Methods**

A retrospective search of the Radiology Information Solution (RIS) system was performed for all patients referred between October 2011 to December 2013. Each report was reviewed on RIS to determine negative studies. Only patients above 35 years who fit the criteria for low risk (<29%) were included. Scans were performed on a dual source CT scanner without prior premedication. Outcome data on major adverse cardiac events (MACE) from the negative studies were obtained via the patient’s electronic records and Office of National Statistics. The follow-up period was 2-4 years.

### **Results**

407 patients had CAC studies. 267 patients with a zero CAC score were included. There were no cases of coronary-related deaths, coronary revascularisation or hospitalisation secondary to acute coronary syndrome (ACS). 14/267 (4.9%) patients re-attended the hospital via emergency department with chest pain but had ACS ruled out. 3/267 (1.1%) deaths occurred with none attributed to cardiovascular disease.

### **Conclusion**

Our study suggests that a negative CAC score in a population referred directly from primary care for exclusion of significant coronary disease in line with NICE guidance 95 is associated with a low incidence of cardiovascular morbidity and mortality.

## **Patterns of early atherosclerosis formation and cardiac remodelling in healthy adults of South Asian and European descent.**

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### **Introduction**

South Asians (SAs) have a higher risk of cardiovascular disease (CVD) and stroke, but paradoxically lower prevalence of peripheral arterial disease (PAD) than Western Europeans (WEs). The aim of this study was to determine early changes in systemic atherosclerotic burden and cardiac remodelling as measured using whole body cardiovascular MRI (WB-CVMR).

### **Methods**

19 SA and 38 age, gender and BMI matched WE were recruited. All were  $\geq 40$  years, free from CVD and with a 10-year risk of CVD  $< 20\%$ . WB-CVMR was performed which comprised a whole body angiogram (WBA) and cardiac magnetic resonance (CMR). These were performed on a 3T MRI scanner following dual phase injection of gadoteric acid. A standardized atherosclerotic score (SAS) was calculated from the WBA, while indexed left ventricular mass and volumes were calculated from the CMR.

### **Results**

SAs exhibited a significantly lower iliofemoral atheroma burden (regional SAS  $0.0 \pm 0.0$  vs  $1.9 \pm 6.9$ ,  $p=0.048$ ) and a trend towards lower overall atheroma burden (WB SAS  $0.7 \pm 0.8$  vs  $1.8 \pm 2.3$ ,  $p=0.1$ ). They had significantly lower indexed left ventricular mass ( $46.9 \pm 11.8$  vs  $56.9 \pm 13.4$  ml/m<sup>2</sup>,  $p=0.008$ ), end diastolic volume ( $63.9 \pm 10.4$  vs  $75.2 \pm 11.4$  ml/m<sup>2</sup>,  $p=0.001$ ), end systolic volume ( $20.5 \pm 6.1$  vs  $24.6 \pm 6.8$  ml/m<sup>2</sup>,  $p=0.03$ ) and stroke volume ( $43.4 \pm 6.6$  vs  $50.6 \pm 7.9$  ml/m<sup>2</sup>,  $p=0.001$ ), but with no significant difference in functional indices.

### **Conclusion**

South Asians have a lower peripheral atherosclerotic burden and smaller hearts than Western Europeans even in a healthy population. Thus the paradoxical high risk of CVD compared with PVD risk may be due to an adverse cardiac haemodynamic status incurred by the smaller heart rather than atherosclerosis.

# **Prevalence, pattern and significance of late gadolinium enhancement in a healthy asymptomatic cohort**

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## **Introduction**

Unrecognised myocardial infarctions (UMIs) have been described in 19-30% of the population using late gadolinium enhancement (LGE). However these studies have focussed on unselected cohorts including those with known cardiovascular disease. The aim of the current study was to ascertain the prevalence of UMIs in a non-high risk population and their physiological significance.

## **Methods**

5,000 volunteers >40 years with no history of cardiovascular disease (CVD) and a 10 year risk of CVD of less than 20% were recruited to the Tayside Screening for Cardiac Events (TASCFORCE) study. Those with a BNP level greater than their gender-specific median were invited for a whole-body MR angiogram and cardiac MR including LGE. LGE was classed as absent, UMI, or non-specific.

## **Results**

1,529 completed the imaging study with 53 (3.6%) excluded due to missing data or inadequate LGE image quality. 10 of the remaining 1476 (0.67%) displayed LGE. Of these, 3 (0.2%) were consistent with UMI, while 7 were non-specific occurring in the mid-myocardium (n=4), epicardium (n=1) or right ventricular insertion points (n=2). Those with UMI had significantly higher BNP (median 116 (range 31-133) vs 22.6 (5-175) pg/ml, p=0.015), lower ejection fraction (54.6 (36-62) vs 68.9 (38-89)%, p=0.007) and larger end systolic volume (36.3 (27-61) vs 21.7 (5-65) ml/m<sup>2</sup>, p=0.014). Those with non-specific LGE had lower diastolic blood pressure (68 (54-70) vs 72 (46-98) mmHg, p=0.013), but no differences in their cardiac function.

## **Conclusion**

Despite previous reports describing high prevalence of UMI, those who are of low-intermediate cardiovascular risk have a very low prevalence of UMI. LGE typical of UMI is associated with significantly impaired cardiac function, while LGE atypical of UMI has no adverse effect on function.

# **Patient preference in myocardial perfusion imaging - comparison between computed tomography, magnetic resonance imaging, invasive coronary angiography with fractional flow reserve, and positron emission tomography**

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## **Introduction**

Myocardial perfusion can be assessed using a variety of imaging modalities, but little is known regarding patient preference or acceptability. This study assessed patient experience of myocardial perfusion imaging using computed tomography (CT), magnetic resonance imaging (MRI), invasive coronary angiography (ICA) +/- fractional flow reserve and oxygen-15 positron emission tomography (PET/CT).

## **Methods**

31 patients underwent CT as part of a research study and completed questionnaires. Of these 28 underwent ICA, 26 MRI and 14 PET/CT. Patients rated concern, comfort and satisfaction on a 5 point Likert scale. Pain during/after investigations were assessed and overall preferences and comments were recorded.

## **Results**

Prior to CT 71% had no concern, compared to 69% for PET/CT, 50% for MRI and 39% for ICA. The main reasons cited for concern were claustrophobia for MRI and potential side-effects for ICA. Patients reported similar comfort and overall satisfaction for all modalities. Pain during the investigation was slightly lower for ICA compared to MRI or CT, but this difference was not statistically significant. However, pain after the investigation was significantly higher for ICA compared to MRI or CT ( $P < 0.001$ ). CT was the preferred modality for 42%, compared to ICA for 31%, MRI for 12% and PET/CT for 4%. All patients would be willing to undergo CT or PET/CT again compared to 96% for MRI and 79% for ICA.

## **Conclusion**

Although overall satisfaction and comfort were similar for all imaging modalities, ICA was associated with more discomfort after the procedure and MRI with more concern regarding claustrophobia.

## **VIDEO CASE ABSTRACTS**

- These four cases will be presented on the 6<sup>th</sup> of May

### **Unbreak my heart**

Bhavna Pitrola, Michelle Mak

A 44 year old woman, with a background of depression, presented to the emergency department with multiple self-inflicted stab wounds to the chest and abdomen. She was hypotensive, and a FAST scan revealed a pericardial effusion. She was taken to theatre for emergency thoracotomy, where an emergency patch was performed. She is currently planned for surgical repair, and we present a short video of a multi-modality approach including ECHO, invasive angiogram, CT and MRI.

### **Pulmonary artery dissection in an adult with uncorrected type II truncus arteriosus**

John Dreisbach, Giles Roditi, Niki Walker, Hamish Walker

A 27 year old woman with a known history of uncorrected congenital heart disease and pulmonary hypertension presented with chest pain. No past medical notes or further details of the malformation were available at the time of presentation. ECG revealed normal sinus rhythm and right ventricular hypertrophy. Troponin was negative, but she was polycythaemic.. Chest X-Ray showed cardiomegaly, pulmonary artery enlargement and pulmonary plethora. CT and MRI imaging demonstrated uncorrected truncus arteriosus with separate origins of the left and right pulmonary arteries arising from the dorsal aspect of the truncus (Collett Edwards type II), a large perimembranous outlet ventricular septal defect, right ventricular hypertrophy, and an anomalous LMS ostium with a non-interarterial course. Furthermore, the presenting chest pain was accounted for by an acute dissection of the left pulmonary artery with a partially thrombosed false lumen. She remained stable throughout her admission with medical management.

### **Descending aorta to right atrial tunnel in a newborn.**

Garfath-Cox KAG, Ho A, Abbas A, Harden SP, Peebles CR, Shambrook JS.

A previously well week old baby presented floppy and unresponsive with cardiovascular collapse. The baby required CPR, intubation and an adrenaline infusion. Echocardiography demonstrated an abnormal and tortuous connection from the descending aorta potentially to the right atrium. CT was requested to further delineate the anatomy. Two and three dimensional reconstruction of the abnormal tunnel allowed full understanding and visualisation of the abnormal vascular anatomy and

led to successful catheter closure of this shunt. Aortico-right atrial fistulae are a rare congenital anomaly of the heart, the majority of which arise from the ascending aorta and must be differentiated from coronary cameral fistula. Descending aortic-right atrial fistulae are even less common. In the context of complex rare vascular malformations, advanced CT data processing goes beyond aesthetically pleasing images to provide clinically valuable information.

**Circumferential ascending aorta dissection with intimal intussusception: an unusual cause of left anterior descending artery (LAD) infarct.**

Yan Ning Neo, Jonathan Weir-McCall

61 years-old male presented with acute onset chest pain and ST elevation on a background of prior left circumflex stenting several years ago for stable angina. He was transferred to the cath lab where engagement of the left coronary was technically challenging. After stenting of the LMS, angiography continued to show marked irregularity of the left circumflex artery and complete occlusion of the LAD, and a markedly abnormal appearance of the aortic sinus. In addition the right coronary artery could not be cannulated. The suspicion of an aortic dissection was raised and he was transferred straight for an emergency ungated CT. A transmural perfusion defect involving anterior and septal walls was seen in the left ventricle, consistent with LAD occlusion. The oblique axial and sagittal images of the aorta root show a highly unusual circumferential aortic dissection involving both coronary ostia with the dissection flap intussuscepting into the ascending aorta.