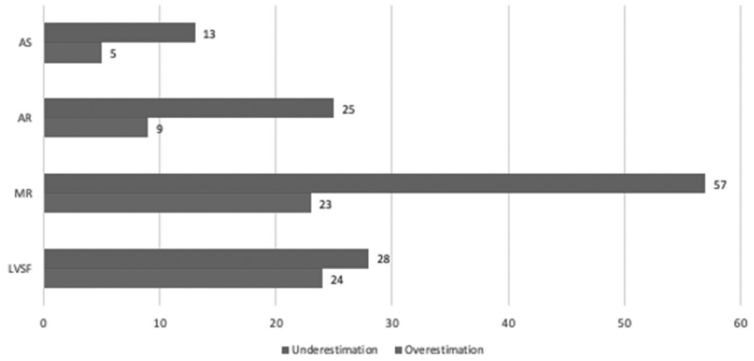

Abstract 14 Figure 2 Graph demonstrating the proportion of underestimation and overestimation in discordant scans across each parameter

Abstract 14 Table 1 Severity grading system used to assess left ventricular systolic function (LVSF), mitral regurgitation (MR), aortic regurgitation (AR) and aortic stenosis (AS)

Severity	Grading Score
Normal/preserved	0
Mild	1
Moderate	2
Severe	3

Abstract 14 Table 2 Table showing average error for each parameter pre- and post-intervention with respective weighted kappa statistics (⍰)

Parameter	Pre-intervention		Post-intervention	
	Average Error	*k*	Average Error	*k*
LVSD	0.34	0.51	0.52	0.53
MR	0.55	0.29	0.40	0.34
AR	0.25	0.35	0.12	0.75
AS	0.21	0.37	0.04	0.51
Total	0.34	0.38	0.27	0.53

Kappa values of <0.2 were interpreted as poor, 0.21–0.4 as fair, 0.41–0.6 as moderate, 0.61–0.8 as good, and 0.81–1.00 as excellent.

Conclusion Our results are concordant with previous studies demonstrating that diagnostic accuracy of hTTE is heavily influenced by operator experience. It is less known how much training should be given to operators before hTTE assessment is reliable enough to base clinical decisions upon. However with simple education, we hope to demonstrate that discrepancy between hTTE and sTTE can be reduced. Moving forwards, we plan to introduce a dedicated training day for new ST3 cardiology trainees and observe how this influences performance. The discrepancy and underestimation with hTTE raises the question of clinical implications, particularly of underestimating MR. It may be the case that cardiology trainees should be more prudent when commenting on MR, spend slightly longer obtaining images if MR is present and liaise more closely with medical colleagues informing them about the limitations of HHE.

Conflict of Interest None

15 IMPROVEMENT IN DIAGNOSIS OF ISCHAEMIC CARDIOMYOPATHY BY CARDIOVASCULAR MAGNETIC RESONANCE

[1]Vijay Shyam-Sundar*, [2]Peter Swoboda, [2]Richard Cubbon, [2]John Greenwood, [2]Mark Kearney, [2]Sven Plein, [2]Klaus Witte. *[1]Leeds General Infirmary; [2]LICAMM, University of Leeds*

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Background Risk stratification in heart failure is important as it enables personalised care. A diagnosis of ischaemic cardiomyopathy (ICM) is important as it has a higher risk than non-ischaemic cardiomyopathy (NICM) and it may be treated with an ICD. Results of the Danish Study to Assess the Efficacy of ICDs in Patients with Non-ischemic Systolic Heart Failure on Mortality (DANISH) trial have suggested the prognostic benefit from defibrillator therapy in patients with NICM may be less than previously thought. Late gadolinium enhancement (LGE) cardiovascular magnetic resonance (CMR) in a subendocardial or transmural pattern is validated for the detection of prior myocardial infarction. We hypothesised that the use of LGE CMR would alter the diagnosis of ICM in patients with newly presenting heart failure.

Methods We identified patients in the Leeds Heart Failure registry who had a clinically indicated CMR scan including LGE imaging. We also collected data on coronary angiogram findings, presence of previous myocardial infarction (MI), and revascularisation status (percutaneous coronary intervention and/or coronary bypass grafting). We classified patients with ICM by current American College of Cardiology (ACC) definition as used in trials such as the Surgical Treatment of Ischaemic Heart Failure Trial (STICH) by any of:

1. Prior MI
2. Prior revascularisation and significant coronary artery disease
3. 75% stenosis of the Left Main Stem or left anterior descending coronary artery
4. 75 % stenosis of both the Right coronary artery and the left circumflex arteryICM was defined by CMR findings when a subendocardial or transmural pattern of LGE was identified

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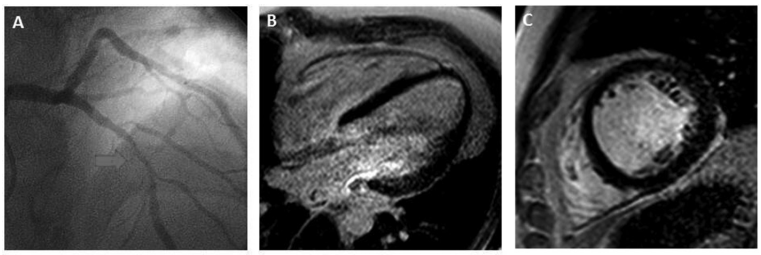

Abstract 15 Figure 1 Case 1- severe disease in mid LAD (arrow) on invasive angiography (A) but no ischaemid scar on LGE imaging (B & C)

by an independent level 3 CMR reporter. Concordance between ACC and CMR diagnosis of ICM was tested using Cohen's Kappa statistic, with 1 implying complete agreement, and -1 complete disagreement. Net reclassification index was calculated to define how CMR modifies ACC definition of ICM.

Results 147 patients were included in the analysis. Their mean age was 61.3 (SEM 1.1), 79.5% were male, 19.9% had NYHA class 3 or 4 symptoms, and LV ejection fraction was 30 % (SEM 1%). Heart failure therapy included 54 % (SEM 3) of the maximum licenced dose of ACE inhibitor or ARB, 46% (SEM 3) of the maximum licenced dose of beta-blocker, and 43mg (SEM 4) furosemide per day. Overall, there was discordance between ACC and CMR definitions in 30 (20.4%) cases. The net reclassification index was 38.3%, with 7/62 cases of ICM diagnosed by CMR being classified by ACC definition as NICM, and 23/85 cases diagnosed as NICM by CMR being defined as per the ACC definition as ICM as demonstrated in case 1. There was significant disagreement between the two methods, with a Cohen's Kappa statistic of 0.596 (SEM 0.064; $p<0.001$). Figure (Case1)

Conclusion Classification of ICM is significantly altered by using CMR with patients being reclassified in both directions. Further studies are needed to establish if this improves long term risk stratification in patients with ICM.

Conflict of Interest None

16 ASSESSING THE ACCURACY OF A NOVEL IN SILICO IMAGING TOOL FOR THE 3D RECONSTRUCTION OF CORONARY VASCULATURE IN THE CONTEXT OF VIRTUAL FRACTIONAL FLOW RESERVE

Roshni Solanki*, Rebecca Gosling, Vignesh Rammohan, Rodney Hose, Patricia Lawford, Julian Gunn, Paul Morris, Yousef Ahmed. *University of Sheffield*

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Fractional flow reserve (FFR) is the gold standard method for guiding percutaneous coronary intervention. 'Virtual' FFR (vFFR) offers a less-invasive alternative but accuracy is critically dependent on accurate 3D arterial reconstruction. This is especially challenging with angiography-based solutions due to practical challenges relating to image acquisition, notably table movement between image acquisitions. Some existing methods rely upon restricting table movement, but this poses difficulty in clinical practice. The aim of this study was to validate a novel method for 3D coronary arterial reconstruction under clinically realistic conditions.

Six branched coronary arterial models (3 left and 3 right, 15 vessels) were generated in silico using patient angiograms and 3D printed in PLA (RepRap X400 PRO). All physical models underwent standard coronary angiography imaging. Each model was imaged three times with different restrictions on table movement (18 image datasets, 45 single-vessels). For 3D reconstruction, vessel centrelines were manually traced on two images >30° apart; automatic detection of the borders and diameter optimisation followed (Figure 1). All reconstructions were subjected to vFFR computation. Reconstructions were compared to the reference 3D files in terms of surface similarity (defined using Hausdorff measurements; averaged distance between a randomised sample of points on both meshes) and physiological analysis (vFFR). The effect of surface reconstruction error on physiological accuracy (vFFR) was described using Pearson's correlation coefficient. To assess accuracy of diameter capture, three aluminium coronary phantoms were fabricated with concentric and eccentric stenoses (diameter range 0.74–1.77mm, % narrowing: 44.7–77.2%). These phantoms also underwent angiography and 3D reconstruction as previously described. Reconstructions were compared with physical micrometer measurements of percentage stenosis and minimum diameter. Accuracy was expressed as mean delta (±SD) and absolute error.

Forty-five single-vessel reconstructions were analysed (Figure 2). The average distance between reconstructed and reference meshes (reconstruction error) was 0.65mm (±0.30) indicating excellent similarity throughout variation of table movement. Mean vFFR was 0.94 (±0.049) with an average absolute error of 0.008 ±0.0098 and a maximum absolute error of ±0.03. A weak positive relationship between error in reconstruction and physiology was demonstrated ($r = 0.370$, $p = 0.013$). Mean error of stenosis estimation using the metal phantoms was 1.2% (±1.2%). Accuracy of diameter reconstruction at maximum stenosis (minimum diameter) was excellent, with an error of 0.02mm (±0.06mm).

Coronary anatomy can be reconstructed under realistic conditions with an accuracy that is acceptable for clinical decision-making. This novel method has the potential to facilitate interventional decision making as part of a vFFR workflow and may also have value in other areas of anatomical reconstruction.

Conflict of Interest n/a

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