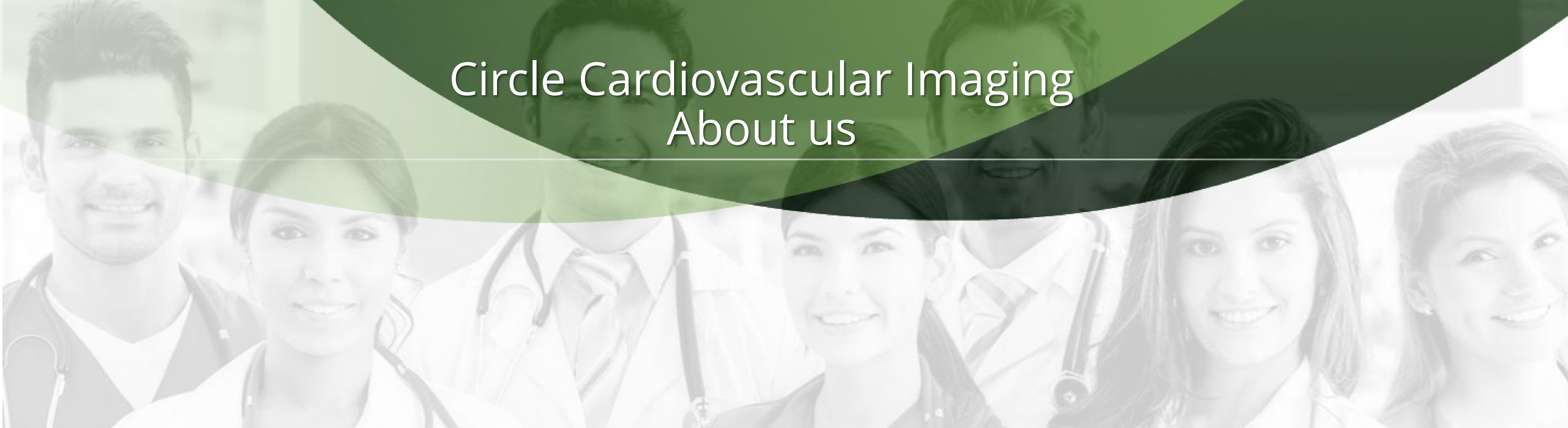
Saving time using AI in CVI workflows

circle CARDIOVASCULAR IMAGING | At the **Heart** of ***IMAGING***

EACVI SCMR summit on AI

Mirjam Peek



Circle Cardiovascular Imaging
About us

Vision

Healthier Lives Through Better Imaging

Mission

Transforming Cardiovascular Imaging Technologies to Better Inform Clinical Decision Making

Circle Cardiovascular Imaging Value proposition

Transforming Cardiovascular Imaging Technologies to Improve patient outcomes

Improve cardiac imaging workflows

Boost clinical decision making

Enhance use of advanced imaging

Circle Cardiovascular Imaging
cvi42 Platform

Automated with AI for an Integrated, Best-in-Class Solution

5 Clinical Areas and Multiple Products

Magnetic Resonance (MR)
- Cardiac MR
- 4D Flow
- Strain
- Quantitative Perfusion

Computed Tomography (CT)
- Cardiac CT
- Auto Plaque

Interventional Planning (IP)
- Mitral Valve
- Aortic Valve

Electrophysiology (EP)
- ADAS 3D LV
- ADAS 3D LA

Echocardiography (EC)
- LVivo Seamless
- LVivo EF
- LVivo Strain
- LVivo RV

Circle Cardiovascular Imaging
Trusted by top institutions around the world

MAYO CLINIC	Shanghai Jiao Tong University School of Medicine 仁濟 1844 RENJI HOSPITAL	National Heart Centre Singapore SingHealth	CHARITÉ UNIVERSITÄTSMEDIZIN BERLIN	NHS Royal Brompton & Harefield NHS Foundation Trust
Centro Cardiologico Monzino	NHS Barts Health NHS Trust	Hôpital européen Georges-Pompidou AP-HP	hhu Heinrich Heine Universität Düsseldorf	Cleveland Clinic
MGH 1811 MASSACHUSETTS GENERAL HOSPITAL	UHN	JOHNS HOPKINS MEDICINE	CS CEDARS-SINAI MEDICAL CENTER. Heart Center	Mount Sinai Hospital
香 港 大 學 THE UNIVERSITY OF HONG KONG	TOGETHER FOR EXCELLENCE HOSPITAL SERDANG	West China School of Medicine West China Hospital of Sichuan University	Vall d'Hebron Hospital	המרכז הרפואי שערי צדק SHAARE ZEDEK MEDICAL CENTER

Circle Cardiovascular Imaging Performance in AI

- Trained CNN automated LV analysis tool performs well compared to manual analysis.
- This proves that machine learning algorithms will play an important role in the future of medical image processing.
- Trends between human and computer contours demonstrate similar outcomes
- Deep Learning can reduce contour time.
- The machine results demonstrated abilities within the same human range

- Golan R, et al. Automatic ventricular segmentation using a convolutional neural network: results from Circle Cardiovascular Imaging on UK Biobank Cardiac MR CINE Images. Poster P290 at SCMR Meet 2018

Circle Cardiovascular Imaging Innovative AI

Accurate
Expert Performance Level

Simple
One click

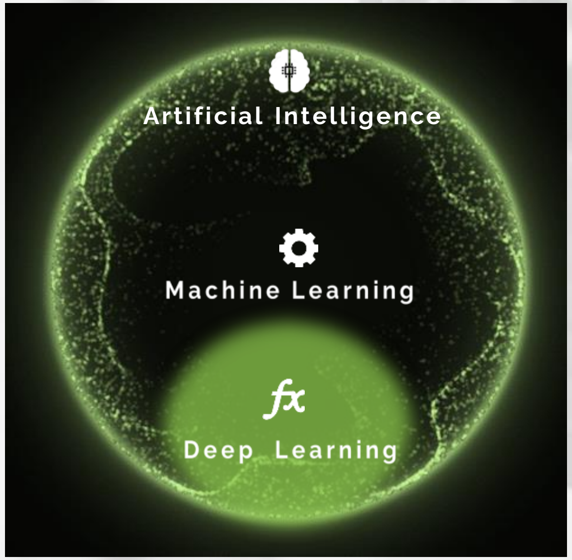
Fast
1 min 30 s < 6 min 15 s

Reproducible
Lower barrier for small centers
Less variability within large centers

Cost Efficient
Increasing patient throughput

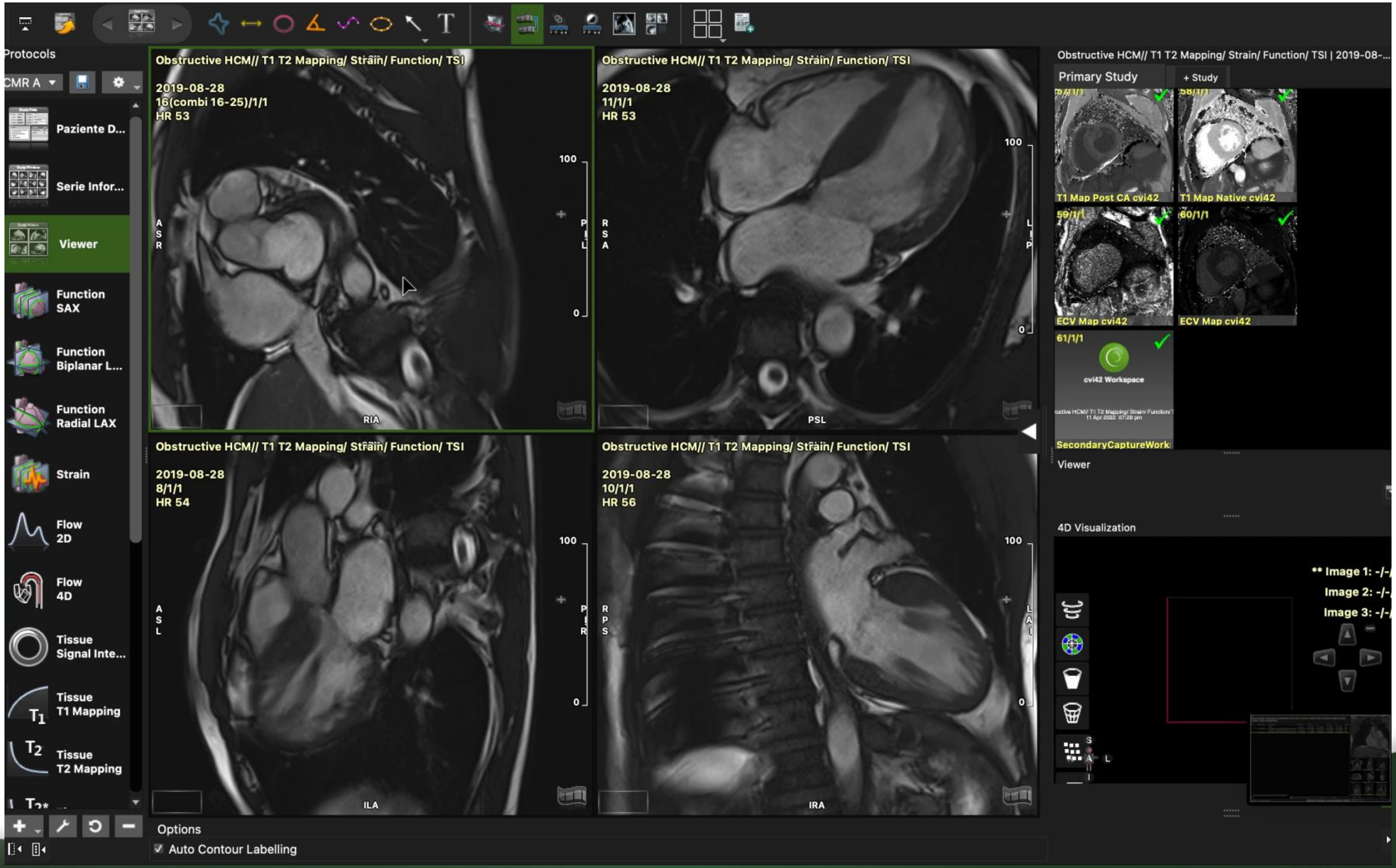
Model validation data:

- Myocardial infarction
- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Ischemic heart disease
- Pulmonary hypertension
- Tetralogy of Fallot
- LVNC



- Golan R, et al. Automatic ventricular segmentation using a convolutional neural network: results from Circle Cardiovascular Imaging on UK Biobank Cardiac MR CINE Images. Poster P290 at SCMR Meet 2018
- Werner D, et l. Effect of Machine Learning support on quantification of ventricular function and volumes in untrained residents – is Machine Learning Support ready for prime time? RSNA 2020
- Adjusted from Steffen Petersen talk on Utility of Deep Learning in clinical CMR at SCMR 22nd Annual Scientific session

Save Time: CMR Function demo



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Save Time: CMR Strain demo

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Save Time: CMR Function report

circle
CARDIOVASCULAR IMAGING

PATIENT INFORMATION

RSNA 1 , ---EMPTY---

Gender	Male	Height (Cm)	177.80	BMI (kg/m²)	27.30
Birthdate	12 Apr 1950 (65 yrs)	Weight (Kg)	86.30	BSA (m²)	2.06 (Mosteller Formula)
Heart Rate	74.00				

STUDY In Progress

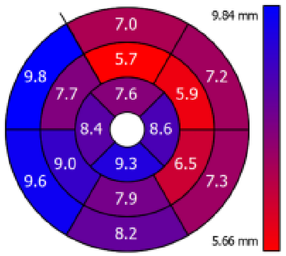
Study Date 12 Jan 2016

GLOBAL LV ASSESSMENT

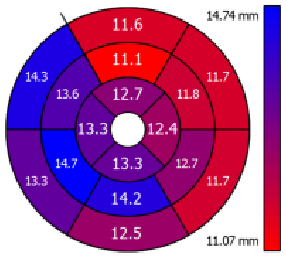
NAME	VALUE	VALUE / HEIGHT	VALUE / BSA
LVEDV	164 ml [99 - 199]	91.99 ml/m [60 - 120]	79.22 ml/m² [53 - 97]
LVESV	56 ml [17 - 69]	31.32 ml/m [12 - 44]	26.98 ml/m² [10 - 34]
LVSV	108 ml [68 - 144]	60.67 ml/m	52.25 ml/m² [37 - 69]
LVEF	66 % [59 - 83]		
LVCO	8.0 l/min		
LVCI	3.9 l/min/m² [>= 2.50]		
LV MASS	122 g [74 - 166]	68.88 g/m [47 - 93]	59.32 g/m² [42 - 78]
HEART RATE	74		
GLOBAL PEAK WALL THICKNESS	12.16 mm		
METHOD	SAX3D Stack		
MAPSE INFERIOR	15.49 mm		
MAPSE ANTERIOR	10.41 mm		
MAPSE LATERAL	18.46 mm		
MAPSE SEPTAL	9.64 mm		
TAPSE	18.23 mm		

Citations: [1] [2]

GLOBAL LV ASSESSMENT (CONTINUED)



Wall Thickness Diastole (mm)



Wall Thickness Systole (mm)

GLOBAL RV ASSESSMENT

NAME	VALUE	VALUE / HEIGHT	VALUE / BSA
RVEDV	188 ml [125 - 237]	105.8 ml/m [73 - 141]	91.12 ml/m² [67 - 111]
RVESV	92 ml [37 - 105]	51.74 ml/m [22 - 66]	44.56 ml/m² [20 - 48]
RVSV	96 ml [74 - 146]	54.06 ml/m	46.56 ml/m² [39 - 71]
RVEF	51 % [49 - 73]		
RVCO	7.1 l/min		
RVCI	3.4 l/min		
HEART RATE	74		

Citations: [1] [2]

ATRIAL ASSESSMENT

NAME	VOLUME	VOLUME / HEIGHT	VOLUME / BSA	AREA
LA Min	29.85 ml	16.79 ml/m	14.46 ml/m²	
LA Max	74.63 ml	41.97 ml/m	36.15 ml/m²	
LAEF	60 %			
Method	Biplanar			

ATRIAL ASSESSMENT (CONTINUED)

RA Min	33.66 ml	18.93 ml/m	16.3 ml/m²	12.68 cm²
RA Max	63.29 ml	35.59 ml/m	30.65 ml/m²	20.33 cm²
RAEF	46.82 %			
Method	Monoplan 4CV			

MYOCARDIAL STRAIN

NAME	LV	RV
SAX Peak Global Circumferential Strain	-20.5 %	
LAX Peak Global Longitudinal Strain	-14.7 %	

Citations:

[1] Hudsmith LE, Petersen SE, Francis JM, Robson MD, Neubauer S. Normal human left and right ventricular and left atrial dimensions using steady state free precession magnetic resonance imaging. J Cardiovasc Magn Reson PubMed. 2005; 7:775-782.
[2] Hudsmith LE, Petersen SE, Francis JM, Robson MD, Neubauer S. Height-Indexed Data from Normal human left and right ventricular and left atrial dimensions using steady state free precession magnetic resonance imaging. Letter. 2006;

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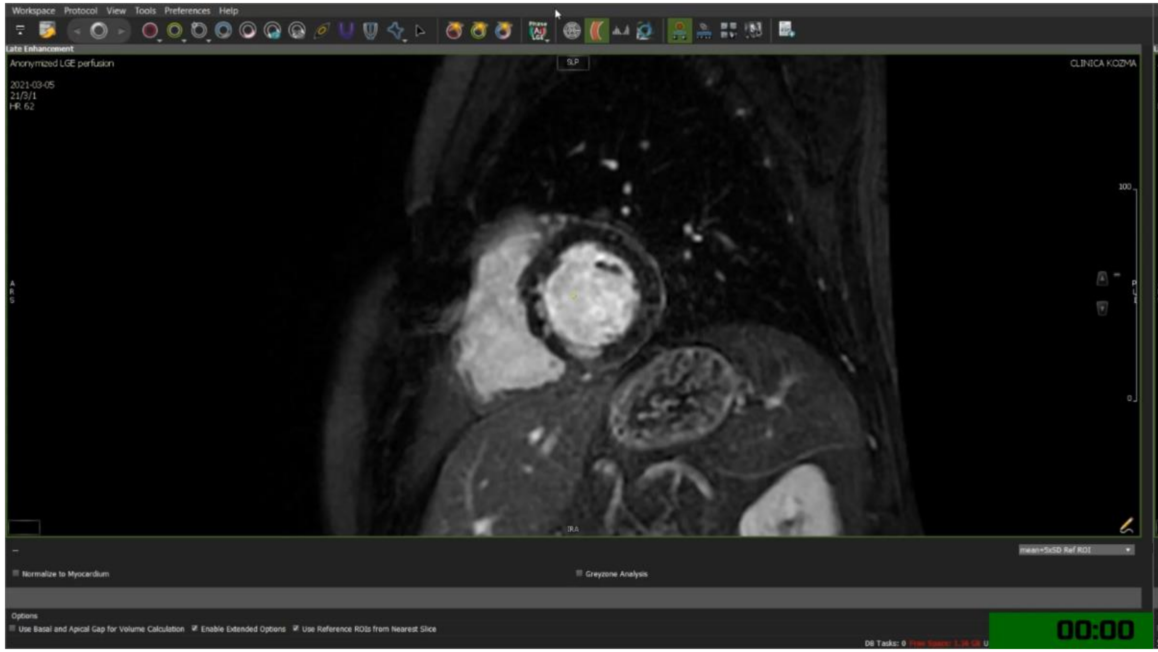
Save Time: LGE Quantification



Automatic Full Stack LGE quantification
around 1 minute

Manual Full Stack LGE
quantification around 5 minutes

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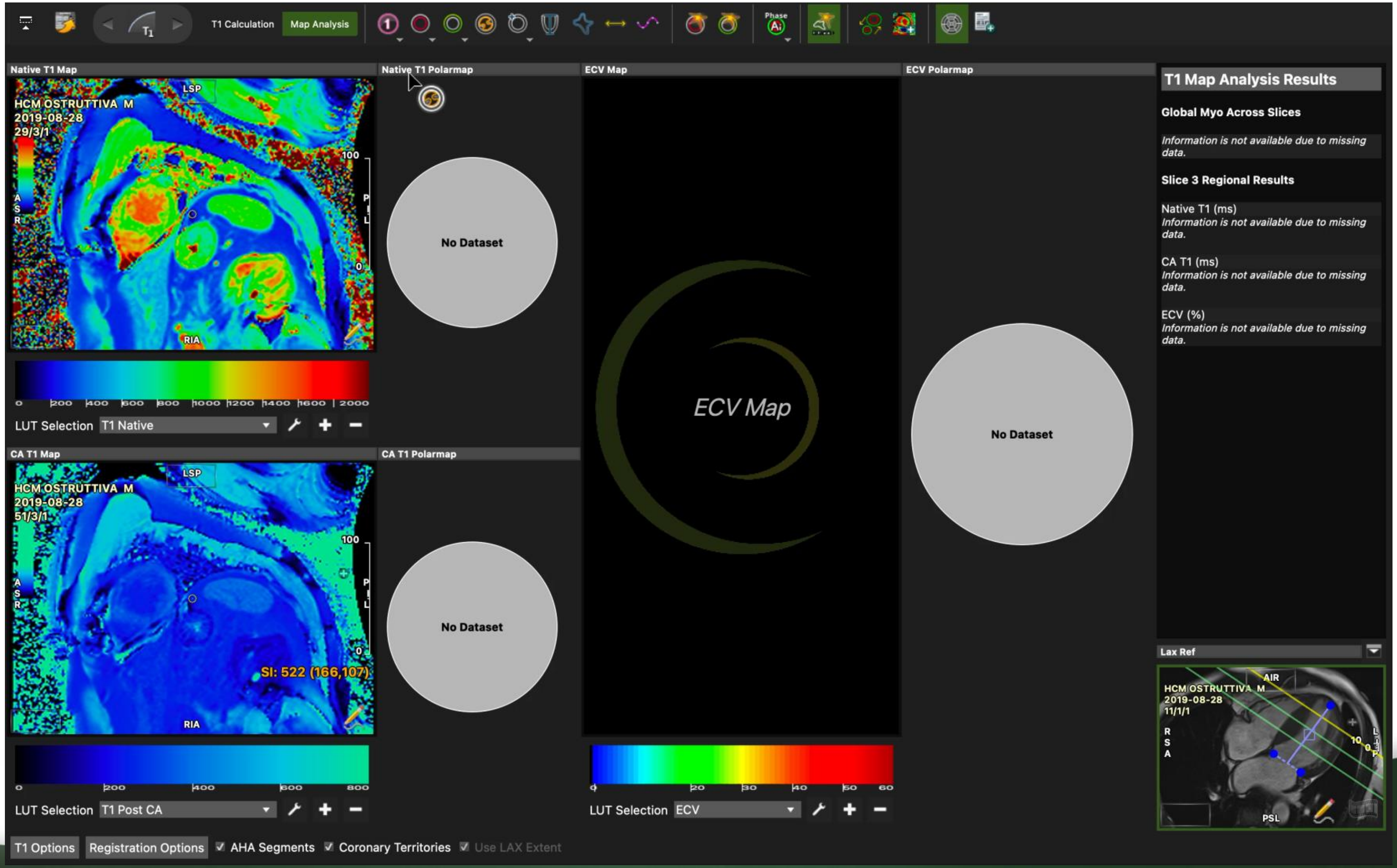
Save Time: Mapping



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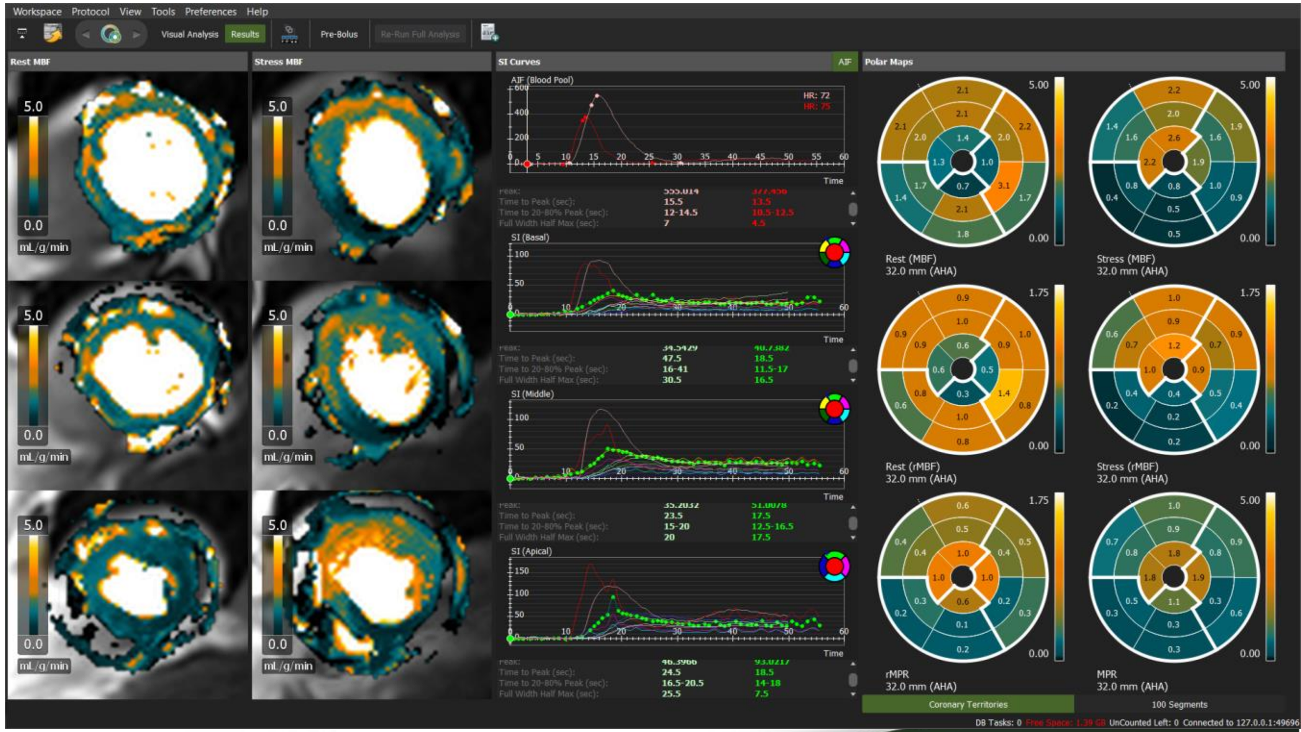
CMR Indication update and Quantitative Perfusion

CMR indications in the *2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain*

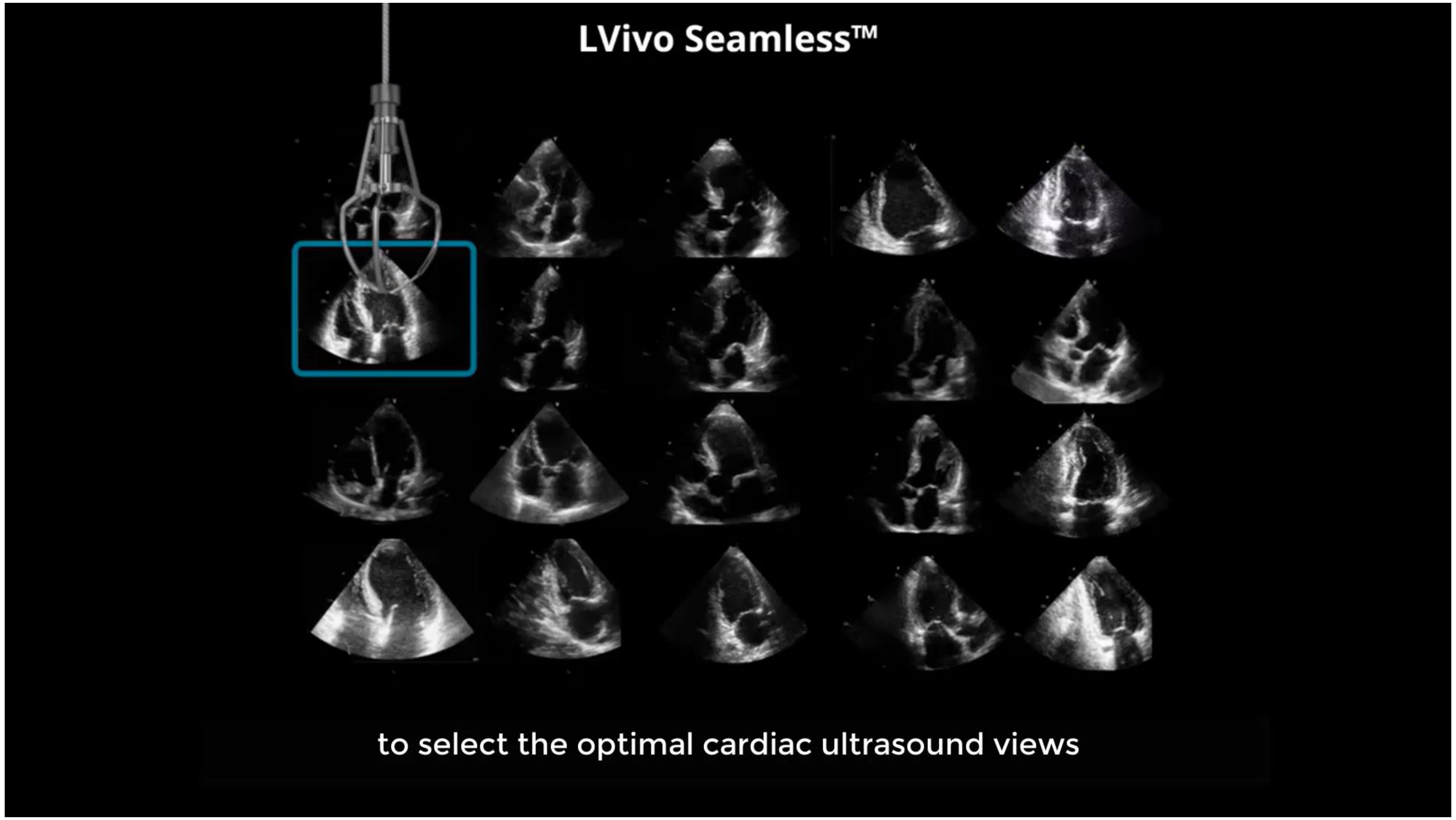
Society for Cardiovascular Magnetic Resonance

Acute chest pain	Stable chest pain
Class 1: Acute chest pain with no known CAD	**Class 1**: Stable chest pain with no known CAD
Class 1: Acute chest pain with prior CABG	**Class 1**: Stable chest pain with obstructive CAD
Class 1: Suspected MINOCA/myopericarditis	**Class 2a**: Suspected INOCA
Class 2a: Acute chest pain with known CAD	**Class 2a**: Stable chest pain with prior CABG
Class 2a: Acute chest pain with known valve disease	**Class 2a**: Stable chest pain and non-obstructive CAD



Circle CVI LVivo™ Solution - Seamless

Automatic AI-based image selection and analysis for your echocardiology studies



Generating Key Clinical Indicators

Ejection Fraction (EF)

Global and Segmental LV Strain

Right Ventricle Analysis

Thank you

Visit our booth!

Join our Symposium tomorrow

circle CARDIOVASCULAR IMAGING | At the Heart of IMAGING

EACVI SCMR summit on AI

Mirjam Peek

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SCMR Society for Cardiovascular Magnetic Resonance

EACVI European Association of Cardiovascular Imaging

European Society of Cardiology

AI Solutions to Improve Patient Care

Friday May 6, 2022 at 12:30-13:30 (BST)

Prof. Sven Plein

Prof. James Moon

Prof. Tim Leiner

Dr. Nicole Seiberlich