ABSTRACTS
NVVC Voorjaarscongres 2025
Donderdag 10 april
09.00 – 10.30 uur

SESSIE 3: Imaging & diagnostics

	Zaal 10	Voorzitters: dr. Miranda Bijvoet, cardioloog Maastricht UMC+ dr. Rosemarijn Jansen, cardioloog i.o. St. Antonius Ziekenhuis
1	09.00 - 09.10	**Three-Dimensional CT for pre-Procedural Planning of PCI for Ostial RCA Lesions: a Randomized Controlled Pilot Trial** *Deborah M.F. van den Buijs (Medical Center Leeuwarden)*
2	09.11 - 09.21	**Large Language Models Are Accurate and Efficient in Automatic Annotation of Free-Text Coronary Computed Tomography Angiography Reports** *Gaby Liao (Leiden University Medical Center, Leiden)*
3	09.22 - 09.32	**Exploring Iron Deficiency in Engineered Heart Tissues: A New Approach to Understanding Cardiac Health** *Sam Majoor (UMCG, Groningen)*
4	09.33 - 09.43	**LGE-Based Simulations to Improve ICD Therapy Prediction in Post-Infarct Patients** *Janneke C. Burger (Amsterdam UMC, Amsterdam)*
5	09.44 - 09.54	**Comparative Analysis of CT and CMR-derived Ventricular Models using ADAS 3D and inHEART for VT Substrate Assessment** *Damian Laan (Amsterdam UMC, Amsterdam)*
6	09.55 - 10.05	**Left Atrial Atrain has Prognostic Value in Dilated Cardiomyopathy Patients with Recovered Ejection Fraction** *Max F.G.H.M. Venner (CARIM, Maastricht)*
7	10.06 - 10.16	**Optimizing Heart Rate with Metoprolol for Coronary CT Angiography: a Dose-Response Analysis and Recommendations from a Large Cohort** *Victor A. Verpalen (Amsterdam UMC, Amsterdam)*
8	10.17 - 10.27	**Individuals with Type 2 Diabetes Have Increased Coronary Plaque Burden and Plaque Progression During 10-Year Serial Coronary CT Angiography Follow-up** *Emilie L. Gaillard (Amsterdam UMC, Amsterdam)*

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Abstract 1

Three-Dimensional CT for pre-Procedural Planning of PCI for Ostial RCA Lesions: a Randomized Controlled Pilot Trial

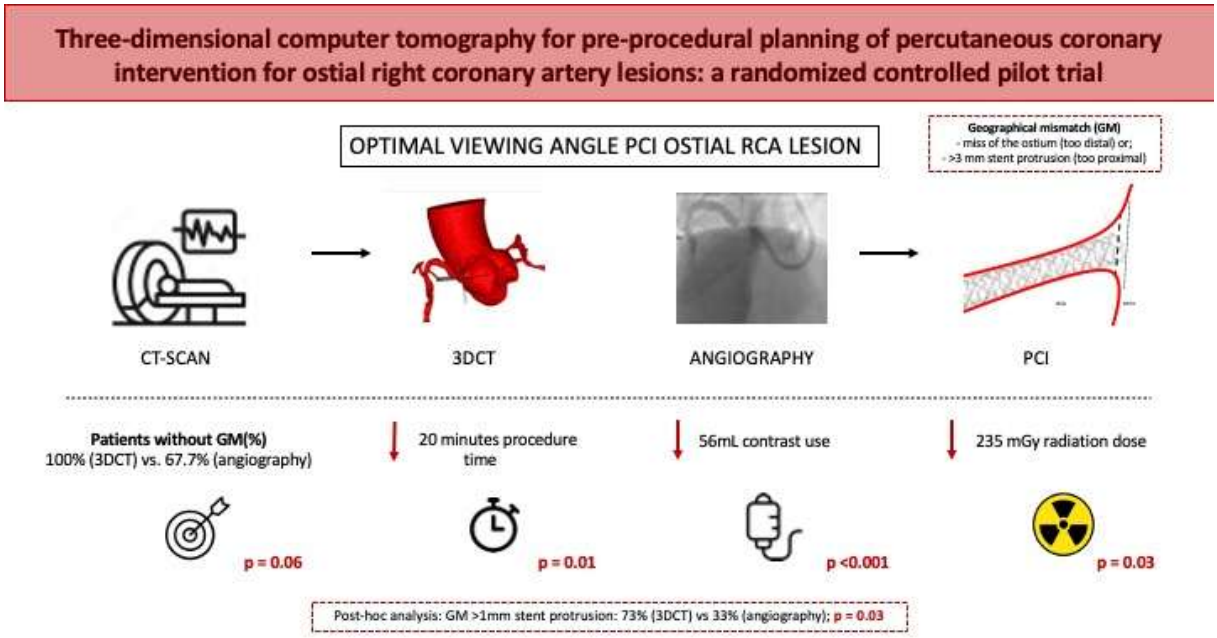
Presenting author: D.M.F. van den Buijs
Department: Cardiology

D.M.F. van den Buijs (Medical Center Leeuwarden, Leeuwarden); E.M. Poels (Ziekenhuis Oost-Limburg, Genk); E. Willems (Ziekenhuis Oost-Limburg, Genk); D. Cottens (Ziekenhuis Oost-Limburg, Genk); K. Dotremont; K. de Leener; E. Meekers (Ziekenhuis Oost-Limburg, Genk); B. Ferdinande (Ziekenhuis Oost-Limburg, Genk); M. Vrolix (Ziekenhuis Oost-Limburg, Genk); J. Dens (Ziekenhuis Oost-Limburg, Genk); K. Ameloot (Ziekenhuis Oost-Limburg, Genk)

Purpose:
Geographical stent-ostium mismatch is an important predictor of target lesion failure after percutaneous coronary intervention (PCI) of an aorto-ostial right coronary artery (RCA) lesion. Optimal visualization of the aorto-ostial plane is crucial for precise stent implantation at the level of the ostium. To investigate whether pre-procedural 3-dimensional coronary CT (3DCT) with determination of the optimal viewing angle would allow for more precise stent implantation and reduce time, procedural contrast and radiation dose.
Methods:
In this single-center, prospective, open label, core-lab blinded trial, a total of 30 patients with an aorto-ostial RCA lesion were randomly assigned to either PCI with a pre-procedural 3DCT or angiography guided PCI. The optimal working view angle was determined by 3DCT in the intervention group and by operators' discretion in the control group. Primary endpoint was the percentage of patients without geographical mismatch as determined by IVUS.
Results:
3DCT determined C-arm angles were heterogenous but in general more extreme LAO projections were used ($p<0.0001$). While stent implantation was in the optimal position in all patients randomized to the intervention group, geographical mismatch was present in n=5 (33%) patients randomized to the control group ($p=0.06$). Mean amount of procedural contrast ($p<0.0001$), mean radiation ($p=0.03$) and median procedure time ($p=0.03$) were significantly lower in the intervention group. The 3DCT scan was able to predict calcium arc ($p<0.0001$) and minimum luminal area by IVUS ($p=0.003$).
Conclusion:
Pre-procedural 3DCT planning for PCI of aorto-ostial RCA lesions allows for optimal stent positioning while reducing procedure time, contrast and radiation use.

Keywords:
Ostial right coronary artery stenosis, percutaneous coronary intervention, 3-dimensional CT

Figure:


Three-dimensional computer tomography for pre-procedural planning of percutaneous coronary intervention for ostial right coronary artery lesions: a randomized controlled pilot trial
OPTIMAL VIEWING ANGLE PCI OSTIAL RCA LESION
Geographical mismatch (GM)
- miss of the ostium (too distal) or;
- >3 mm stent protrusion (too proximal)
CT-SCAN
3DCT
ANGIOGRAPHY
PCI
Patients without GM(%)
100% (3DCT) vs. 67.7% (angiography)
p = 0.06
20 minutes procedure time
p = 0.01
56mL contrast use
p <0.001
235 mGy radiation dose
p = 0.03
Post-hoc analysis: GM >1mm stent protrusion: 73% (3DCT) vs 33% (angiography); p = 0.03

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Abstract 2

Large Language Models Are Accurate and Efficient in Automatic Annotation of Free-Text Coronary Computed Tomography Angiography Reports

Presenting author: G. Liao
Department: Cardiology

G. Liao (Leiden University Medical Center, Leiden); G. Liao (Leiden University Medical Center, Leiden); E.A.S. Polomski (Leiden University Medical Center, Leiden); A.A.M. al Jaff (Leiden University Medical Center, Leiden); M.L. Antoni (Leiden University Medical Center, Leiden); M.M. Van Buchem (Leiden University Medical Center, Leiden); J.W. Jukema (Leiden University Medical Center, Leiden); J.C. Heemelaar (Leiden University Medical Center, Leiden)

Purpose:
Manual adjudication of free-text coronary computed tomography angiography (CCTA) reports for research is a time-consuming and resource-intensive process, which is not scalable to large sample sizes (e.g. hospital database wide analysis). Large Language Models (LLM) may be a promising tool due to excellent language understanding capabilities. However, no evidence is available on the performance metrics of LLMs with Dutch medical jargon. Therefore, the aim of this study is to validate an open-source LLM in transforming free-text reports to a discrete, actionable dataset of CCTA.
Methods:
A total of 970 CCTA reports were manually adjudicated in a prior study on late effects of cancer treatment to extract parameters (scan quality, coronary dominance and significant coronary stenosis), and were used as the golden standard. We developed an automated LLM-pipeline (LLaMa 3.1) that iterates through each report to extract the same variables. 100 reports were randomly selected for prompt engineering, and another 100 for validation. The outcomes of interest were: precision, recall, F1-score and processing time.
Results:
The LLM-pipeline exhibited a high accuracy in adjudicating free-text CCTA reports compared to the gold standard (precision=0.90, recall=0.93, F1-score=0.91), while simultaneously reducing the processing time by tenfold compared to manual annotation (median 38 sec vs 388 sec for 10 reports). The most common discrepancy was ambiguous phrasing (N=11).
Conclusion:
Our study highlights the potential of open-source LLM-pipelines to automatically acquire discrete data from free-text CCTA reports with high accuracy. Future perspectives will emphasize external validation of LLMs within other Dutch hospitals and data extraction of other cardiac investigations.

Keywords:
Coronary Computed Tomography Angiography, Large Language Models, Implementation Science

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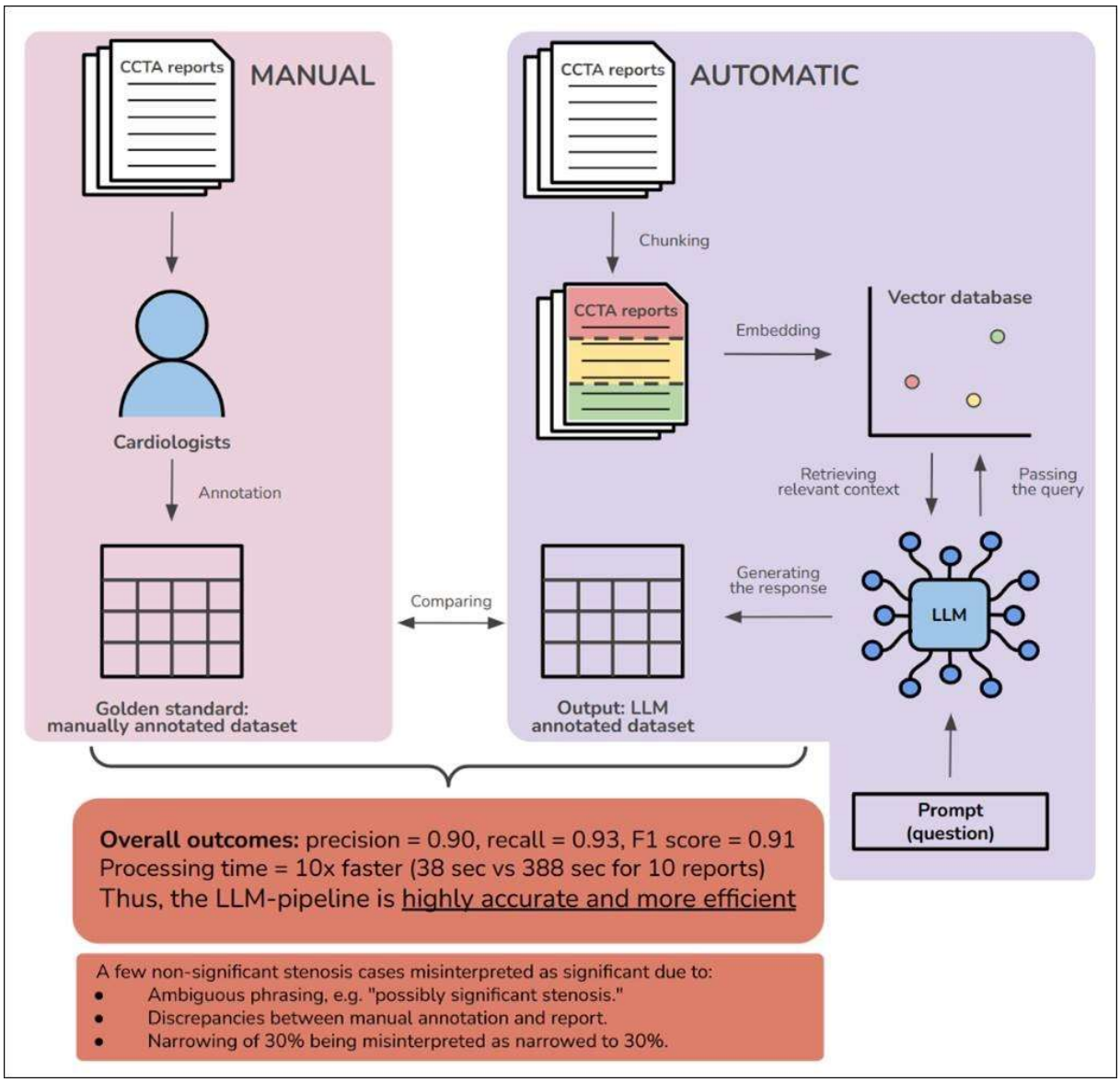
Figure:
Figure 1. Schematic representation of the LLM-pipeline to extract data from Dutch CCTA reports. CCTA reports are initially segmented in chunks, which are transformed in vector embeddings to form a vector database. Subsequently, the LLM retrieves relevant context from the vector database to generate a response for the prompt.



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Session 3: Imaging & diagnostics
Abstract 3

Exploring Iron Deficiency in Engineered Heart Tissues: A New Approach to Understanding Cardiac Health

Presenting author: S. Majoor
Department: Experimental Cardiology

S. Majoor (UMCG, Groningen); N. Grote Beverborg (UMCG, Groningen); N. Bömer (UMCG, Groningen); P. van der Meer (UMCG, Groningen)

Purpose:
Background: Addressing the knowledge gap in the early molecular mechanisms of heart failure (HF) pathogenesis is crucial. Notably, approximately 50% of HF patients are affected by iron deficiency (ID), a condition that impairs critical physiological processes such as erythropoiesis, oxygen storage, and mitochondrial respiration. Hence, ID leads to a progression of HF symptoms and worsens the prognosis. This study aims to understand the functional and pathophysiological consequences of ID on the human myocardium using human Pluripotent Stem Cell (hPSC)-derived 3D Dynamically Cultured Engineered Heart Tissues (Dyn-EHT).
Methods:
Methods: By using hPSC-derived cardiomyocytes, and hPSC-derived cardiac fibroblasts in combination with applied pre-load, the human heart composition was mimicked in Dyn-EHTs as close as currently possible. Dyn-EHTs were iron depleted by treatment with the iron chelator deferoxamine (DFO), DFO was used in various concentrations for four days. Videos of the Dyn-EHTs were made daily to asses functional parameters such as contractile force, pacing frequency, and systolic/ diastolic stress. Iron deficiency was assessed by measuring transferrin receptor (TfRC) mRNA expression.
Results:
Results: A total of 66 tissues were engineered (at least N=6/dose). After four days of DFO treatment, a dose dependent increase in TfRC mRNA expression was measured Functional parameters of the Dyn-EHTs will be quantified in the upcoming months using analyses of the taken videos.
Conclusion:
Conclusions: Administration of DFO results in a dose dependent iron deficiency in Dyn-EHTs. The Dyn-EHT model forms our foundation of further in vitro research into iron deficiency. Aiding in the further understand the pathophysiology of ID in the heart.

Keywords:
Heart Failure, Iron Deficiency, Engineered Heart Tissue

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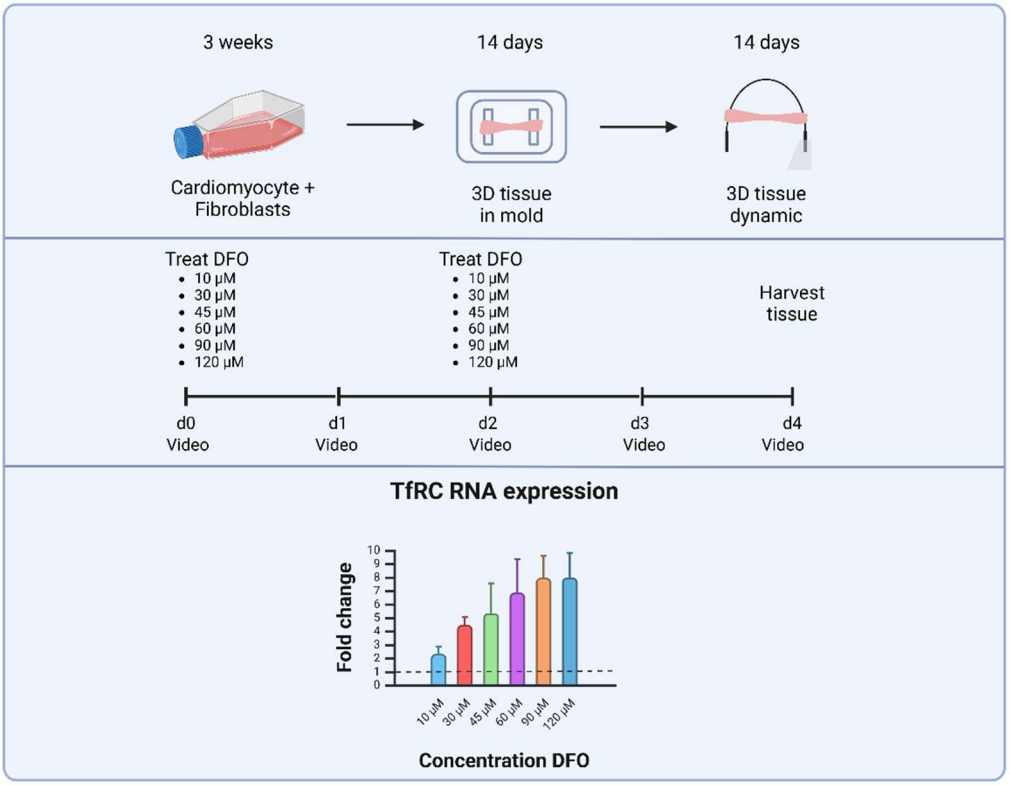
Figure:
Figure description: Graphical abstract; panel one schematically represents the Dyn-EHT formation process. Panel two depicts the DFO treatment scheme following the Dyn-EHT maturation. The last panel shows the dose response of TfRC RNA expression to increasing doses of DFO. Dyn-EHT: dynamically cultured Engineered heart tissues, DFO: Deferoxamine, TfRC: Transferrin receptor.



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Abstract 4

LGE-Based Simulations to Improve ICD Therapy Prediction in Post-Infarct Patients

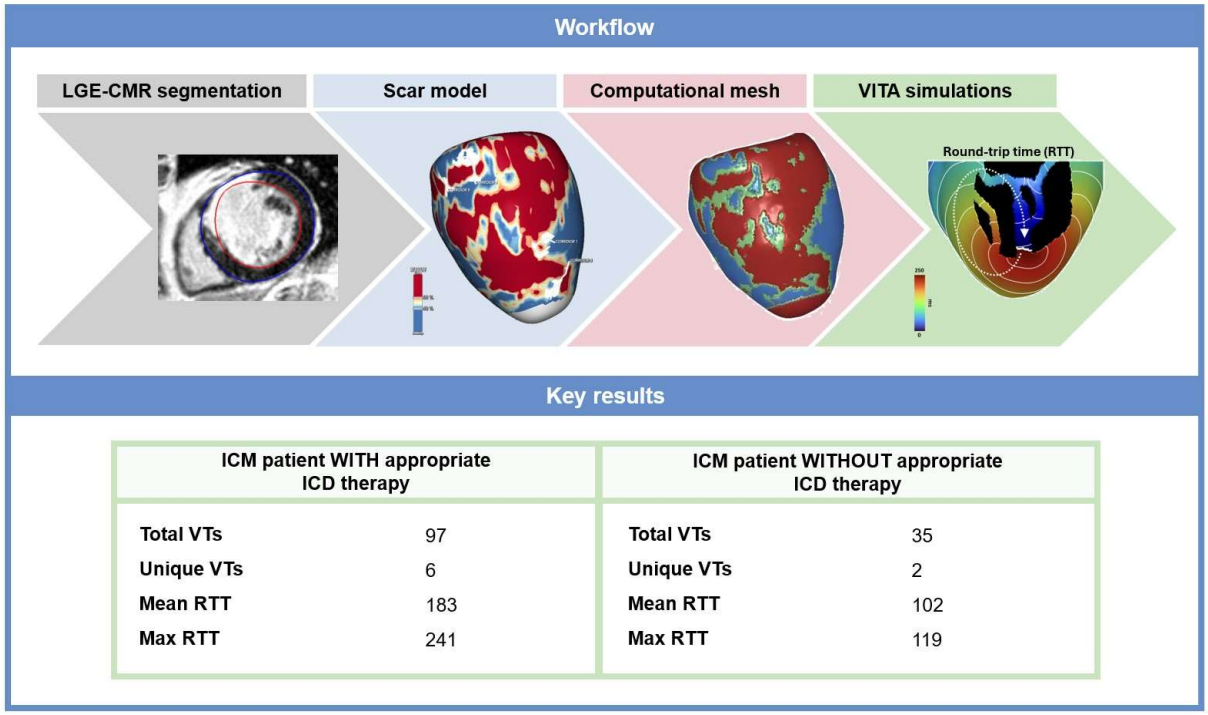
Presenting author: J. C. Burger
Department: Cardiology

J.C. Burger (Amsterdam University Medical Center, Amsterdam); J.C. Burger (Amsterdam University Medical Center, Amsterdam); L.H.G.A. Hopman (Amsterdam University Medical Center, Amsterdam); F. Campos; A.C. van der Lingen (Amsterdam University Medical Center, Amsterdam); C.P. Allaart (Amsterdam University Medical Center, Amsterdam); P.G. Postema (Amsterdam University Medical Center, Amsterdam); M.J.B. Kemme (Amsterdam University Medical Center, Amsterdam); M.J.W. Götte (Amsterdam University Medical Center, Amsterdam); M.J. Bishop (Amsterdam University Medical Center, Amsterdam); V. van Halm (Amsterdam University Medical Center, Amsterdam); P. Bhagirath (Amsterdam University Medical Center, Amsterdam)

Purpose:
Late gadolinium enhancement (LGE)-based modelling techniques have recently emerged to identify key predictors of implantable cardioverter defibrillator (ICD) therapy using patient-specific models, addressing limitations of structural risk stratification methods. The Virtual Induction and Treatment of Arrhythmias (VITA) framework detects critical ventricular tachycardia (VT) isthmuses, proving a tool for arrhythmogenic risk stratification. This study aims to evaluate the relationship between LGE-derived simulation metrics and appropriate ICD therapy.
Methods:
Ischemic cardiomyopathy (ICM) patients who underwent LGE imaging prior to ICD implantation were retrospectively identified. LGE images were post-processed using a commercially available semi-automatic segmentation platform. Subsequent mesh model generation was performed through customized scripts. The meshes were used as input for Reaction-Eikonal modelling to obtain simulation metrics.
Results:
Out of 90 ICM patients, 31 (34.4%) received appropriate ICD therapy. VITA metrics showed a significantly larger number of VTs (97.7±82.1 vs. 35.1±43.3, p<0.001), unique VTs (6.3±4.5 vs. 2.4±2.6, p<0.001), mean round-trip time (RTT) (183.0±83.9 vs. 102.1±90.7, p<0.001) and max RTT (241.3±125.1 vs. 118.9±112.3, p<0.001), in patients with an event. Regression analyses including simulation metrics indicated a significant association between VITA metrics and an event; total VTs (HR 1.01; CI 1.00-1.01, p=0.006), unique VTs (HR 1,09; CI 1.02-1.20, p=0.01), mean RTT (HR 1.01; CI 1.00-1.01, p=0.01) and max RTT (HR 1.01; 1.00-1.01, p=0.003).
Conclusion:
LGE-derived quantitative simulation metrics exhibited predictive capability for ICD therapy, highlighting its potential role in improving risk stratification in ICM patients.
These findings warrant further investigations into arrhythmia simulations in clinical settings to improve patient outcomes.

Keywords:
Implantable Cardioverter Defibrillator, Ventricular Arrhythmia, Computational Modelling

Figure:
VITA simulation pipeline and outcome differences in patients with and without an event.



ICM patient WITH appropriate ICD therapy		ICM patient WITHOUT appropriate ICD therapy	
Total VTs	97	**Total VTs**	35
Unique VTs	6	**Unique VTs**	2
Mean RTT	183	**Mean RTT**	102
Max RTT	241	**Max RTT**	119

Session 3: Imaging & diagnostics
Abstract 5

Comparative Analysis of CT and CMR-derived Ventricular Models using ADAS 3D and inHEART for VT Substrate Assessment

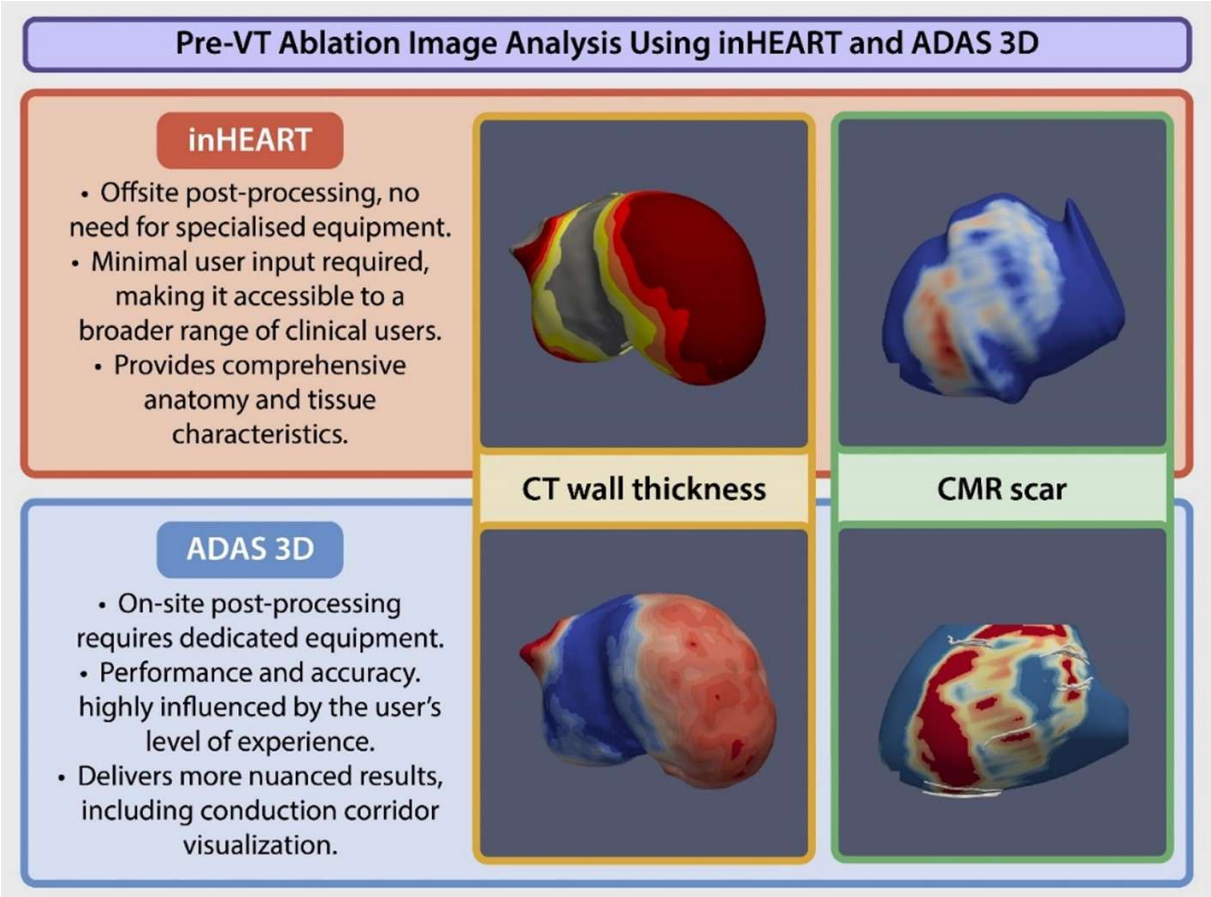
Presenting author: D. Laan
Department: Cardiology

D. Laan (Amsterdam University Medical Center, Amsterdam); *D. Laan (Amsterdam University Medical Center, Amsterdam); L.H.G.A. Hopman (Amsterdam University Medical Center, Amsterdam); M. Götte (Amsterdam University Medical Center, Amsterdam); C.P. Allaart (Amsterdam University Medical Center, Amsterdam); M.J.B. Kemme (Amsterdam University Medical Center, Amsterdam); P.G. Postema (Amsterdam University Medical Center, Amsterdam); P. Bhagirath (Amsterdam University Medical Center, Amsterdam)*

Purpose:
Advances in post-processing software for cardiac magnetic resonance imaging (CMR) and cardiac computed tomography (CCT) have enhanced procedural guidance for catheter ablation. However, a direct comparison between ADAS 3D LV (ADAS LV Medical, Spain) and inHEART (IHU LIRYC and Inria, France) remains unexplored. This study compares CCT- and CMR-derived ventricular substrate models in ischemic and non-ischemic VT patients using ADAS 3D and inHEART to assess inter-platform differences.
Methods:
Patients who underwent both CCT and CMR prior to VT ablation were retrospectively identified. ADAS 3D was used to generate three-dimensional, patient-specific substrate models, while inHEART processed LGE-CMR images and published them via its online platform. A custom scoring system evaluated scar mass, transmurality, wall thickness, scar core, and conduction corridor visualization.
Results:
Sixteen patients (8 ischemic, 8 non-ischemic) were analyzed. ADAS 3D provided better conduction corridor visualization (Figure 1). No significant differences were found in borderzone measurements (ischemic: $Z = -1.52$, $p = 0.128$; non-ischemic: $Z = -0.73$, $p = 0.46$). Scar core analysis yielded comparable results (ischemic: $Z = -0.51$, $p = 0.61$; non-ischemic: $Z = -0.63$, $p = 0.53$). ADAS 3D achieved higher average scores, trending toward significance.
Conclusion:
ADAS 3D and inHEART exhibit distinct strengths in pre-VT ablation imaging. inHEART offers remote processing with minimal user input, while ADAS 3D requires on-site processing and expertise but provides more detailed visualization. Platform choice should consider clinician experience, equipment availability, and visualization needs. Future research should assess the impact of these differences on procedural outcomes.

Keywords:
ventricular tachycardia, late-gadolinium enhancement, substrate

Figure:
Figure 1. Pre-VT ablation image analysis using inHEART and ADAS 3D



Session 3: Imaging & diagnostics
Abstract 6

Left Atrial Atrain has Prognostic Value in Dilated Cardiomyopathy Patients with Recovered Ejection Fraction

Presenting author: M.F.G.H.M. Venner
Department: Cardiology

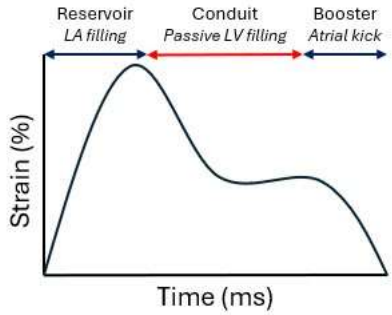
M.F.G.H.M. Venner (CARIM, Maastricht); M.F.G.H.M. Venner (CARIM, Maastricht); J.A.J. Verdonschot (CARIM, Maastricht); C. Knackstedt (CARIM, Maastricht); M.A. Sikking (CARIM, Maastricht); M.T.H.M. Henkens (CARIM, Maastricht); M.R. Hazebroek (Zuyderland Ziekenhuis, Heerlen); A.G. Raafs (CARIM, Maastricht); S.R.B. Heymans (CARIM, Maastricht)

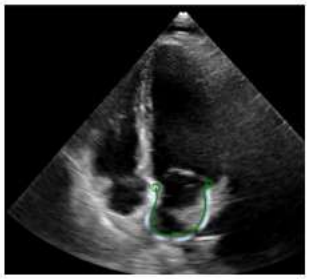
Purpose:
In dilated cardiomyopathy (DCM), structural recovery does not equal recovery of cardiac function when based on conventional parameters such as left ventricular ejection fraction (LVEF). The role of left atrial (LA) function (strain) to predict prognosis in DCM patients with recovered EF, remains unknown. This study evaluates the prognostic value of echocardiographic LA strain in DCM patients with recovered ejection fraction.
Methods:
DCM patients with recovered EF (≥50% and ≥5 EF point increase from baseline). Primary endpoint was the combination of mortality, heart failure (HF) hospitalization, or life-threatening arrhythmias. Harrel's C-indexes and likelihood-ratio-test were performed to determine the value of LA strain in a multivariable survival model using the primary endpoint.
Results:
A total of 201 DCM patients were included (age 58 [47-63] years, 60% male). Thirty-nine patients (19%) reached the primary endpoint (follow-up 7 years). Based on univariable analysis, LA conduit strain was a stronger predictor of outcome compared to reservoir and booster strain. LA conduit strain (HR:3.14, 95%-confidence interval [CI]:1.01-9.77, p=0.048), age (HR:1.10, 95%-CI:1.05-1.16, p<0.001), NYHA class>2 (HR:3.97, 95%-CI:1.49-10.57, p=0.005) and LVMI (HR:1.03, 95%-CI:1.01-1.05, p=0.002) remained associated in the multivariable model. Adding LA conduit strain to other independent predictors (NYHA class, age, and LVMI) significantly improved the calibration and accuracy of the prediction model (p= 0.03).
Conclusion:
Echocardiographic LA conduit strain is an independent and incremental predictor of adverse outcome in DCM patients with recovered LVEF, outperforming LV GLS. LA conduit strain should be measured in DCM patients with recovered ejection fraction to improve risk stratification.

Keywords:
Dilated cardiomyopathy, speckle tracking strain, left atrial phasic function

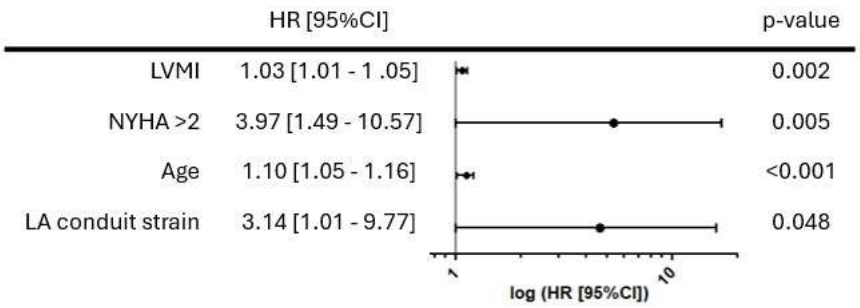
Figure:
Using speckle tracking echocardiography the LA conduit strain can be measured, which reflects the passive LV filling during diastole. In a multivariable adjusted model, LA conduit strain is an independent and incremental predictor of outcome (combination of all-cause mortality, heart failure hospitalization and life-threatening arrhythmias) on top of known predictors.

Echocardiographic speckle tracking left atrial (LA) strain in dilated cardiomyopathy





Multivariable adjusted analysis
Outcome: mortality, heart failure hospitalization and life-threatening arrhythmias



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Session 3: Imaging & diagnostics
Abstract 7

Optimizing Heart Rate with Metoprolol for Coronary CT Angiography: a Dose-Response Analysis and Recommendations from a Large Cohort

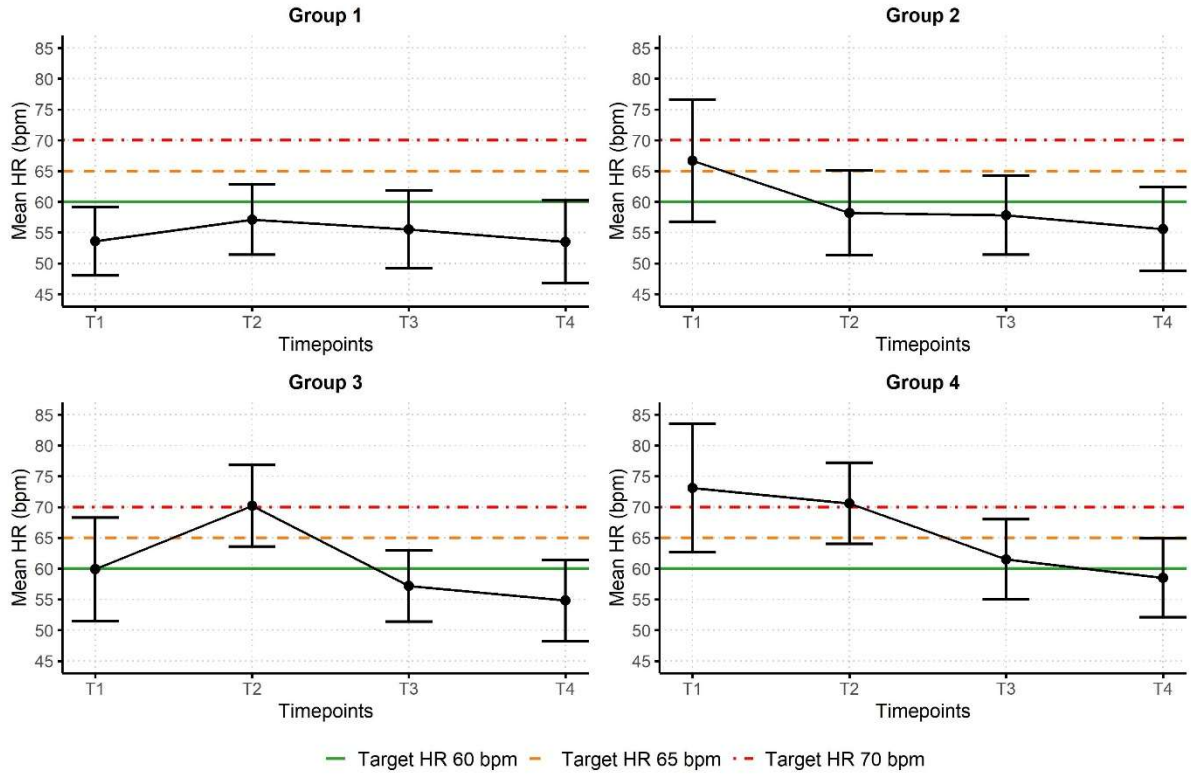
Presenting author: V.A. Verpalen
Department: Cardiology

V.A. Verpalen (Amsterdam UMC, Amsterdam); V.A. Verpalen (Amsterdam UMC, Amsterdam); W.R. van de Vijver (Amsterdam UMC, Amsterdam); O.G. Silveirinha (Amsterdam UMC, Amsterdam); C.F. Coerkamp (Amsterdam UMC, Amsterdam); B.E.P.M. Claessen (Amsterdam UMC, Amsterdam); G.A. Somsen (Cardiology Centers of the Netherlands (CCN), Amsterdam); K.J. Franssen (Amsterdam UMC, Amsterdam); I.I. Tulevski (Cardiology Centers of the Netherlands (CCN), Amsterdam); M.M. Winter (Amsterdam UMC, Amsterdam); J.P.S. Henriques (Amsterdam UMC, Amsterdam); R.A.P. Takx (Amsterdam UMC, Amsterdam); R.N. Planken (Mayo Clinic, Rochester)

Purpose:
A low heart rate (HR) during coronary computed tomography angiography (CCTA) optimizes image quality. This study aimed to investigate the dose-response effect of oral metoprolol succinate and tartrate on HR in patients prepared for CCTA and to assess the association between patient characteristics and failure to achieve the target HR <60 beats per minute (bpm).
Methods:
This retrospective study included 4569 consecutive patients scheduled for CCTA between 2022-2023. Patients were categorized according to the adopted metoprolol preparation strategy (group 1-4). HR was measured at the outpatient visit (T1), CCTA intake (T2), pre-scan (T3) and during CCTA (T4).
Results:
In total, 67% of the patients achieved the target HR <60 bpm at T4. The 3830 patients prepared with succinate (groups 2 and 4) had a mean dose-response of -6.2±10.4 bpm from T1-T2, only 41% achieved the target HR at T2, and 33% (1266/3830) received additional tartrate at T2 (group 4). Those patients prepared with succinate and tartrate demonstrated a reduced dose-response effect of tartrate from T2-T4 compared with patients receiving tartrate only (-11.8±7.9 versus -15.4±7.9 bpm). Female sex, a higher BMI, diabetes, and higher baseline HRs were independently associated with failure to achieve the target HR.
Conclusion:
This study demonstrates the dose-response effect of metoprolol on HR before CCTA, highlighting underdosing of both succinate and tartrate, without safety concerns. Tartrate was more effective, particularly in patients without prior succinate preparation. Doses of 100 mg are recommended for most patients with an HR >65 bpm, guided by patient characteristics.

Keywords:
Coronary computed tomography angiography, Heart rate, Beta-blockers

Figure:
T1, outpatient visit; T2, CCTA intake 60 minutes before scan; T3, pre-scan; T4, during CCTA.
Group 1 = Patients not prepared with metoprolol before CCTA; Group 2 = Patients prepared with metoprolol succinate days before CCTA, no metoprolol tartrate 60 minutes before CCTA; Group 3 = Patients prepared with metoprolol tartrate 60 minutes before CCTA, no metoprolol succinate days before CCTA; Group 4 = Patients prepared with metoprolol succinate days before CCTA AND metoprolol tartrate 60 minutes before CCTA



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Session 3: Imaging & diagnostics
Abstract 8

Individuals with Type 2 Diabetes Have Increased Coronary Plaque Burden and Plaque Progression During 10-Year Serial Coronary CT Angiography Follow-up

Presenting author:
Department: cardiologie en vasculaire geneeskunde

E.L. Gaillard (Amsterdam UMC, Amsterdam); E.L. Gaillard (Amsterdam UMC, Amsterdam); N.S. Nurmohamed (Amsterdam UMC, Amsterdam); M.J. Bom (Amsterdam UMC, Amsterdam); S. Ibrahim (Amsterdam UMC, Amsterdam); R.N. Planken (Amsterdam UMC, Amsterdam); S.M. Boekholdt (Amsterdam UMC, Amsterdam); A.D. Choi (Amsterdam UMC, Amsterdam); E.S.G. Stroes (Amsterdam UMC, Amsterdam); Paul Knaapen (Amsterdam UMC, Amsterdam)

Purpose:
Individuals diagnosed with type 2 diabetes mellitus (T2DM) are at high risk for coronary artery disease, however, data on long-term progression of coronary artery plaque burden is lacking. This study investigated atherosclerotic plaque characteristics and long-term coronary plaque progression in patients with and without T2DM.
Methods:
Per-protocol, patients from a coronary CT angiography (CCTA) cohort were invited for repeat CCTA imaging, regardless of symptoms. A total of 299 patients underwent follow-up imaging with a median scan interval of 10.2 [IQR 8.7-11.2] years. Patients who underwent coronary artery bypass grafting and vessels revascularized by percutaneous coronary intervention were excluded. Scans were analyzed using atherosclerosis imaging-quantitative CCTA analysis (AI-QCT; Cleerly Inc.). The associations between diabetic status, baseline and follow-up plaque burden and characteristics were evaluated using multivariable regression adjusted for clinical risk factors, statin use, baseline plaque volumes and scanner settings.
Results:
In total, 267 patients were included, 44 (16.5%) had T2DM at baseline. The mean age was 57±7 years, 43% were women. At baseline, patients with T2DM had a median percent atheroma volume (PAV) of 5.1 (1.7, 10.9), patients without T2DM had a median PAV of 2.2 (0.5, 5.8). Adjusted for clinical risk factors, patients with T2DM had higher plaque burden at both baseline and follow-up (Figure 1). After adjustment for clinical risk factors and baseline plaque volumes, individuals with T2DM had a higher rate of plaque progression. The difference in PAV caused by T2DM was similar to the effect of a 16-year age difference. After 10 years of follow-up, patients with T2DM had a higher prevalence of both high-risk plaque (OR 3.07; $p<0.001$) and low-density plaque (OR 2.97; $p<0.001$).
Conclusion:
Patients with T2DM had a more than twofold higher coronary plaque burden, an increased rate of plaque progression during 10-year follow-up, and had an increased prevalence of high-risk and low-density plaque.

Keywords:
imaging, coronary artery disease, diabetes mellitus

Figure:
Shown are beta coefficients for Type 2 Diabetes Mellitus compared to no Diabetes Mellitus from linear regression models. Adjusted models account for sex, age and clinical risk factors, which include body mass index, systolic blood pressure, LDL cholesterol, lipoprotein(a), triglycerides, hypertension, hypercholesterolemia, smoking, family history of coronary artery disease and statin use.

Figure 1. Associations between Type 2 Diabetes Mellitus and Coronary Plaque Burden and Progression

Outcome variable	β (95% CI)	p-value
Baseline imaging		
Percent atheroma volume	3.39 (1.32 to 5.46)	0.001
	2.41 (0.36 to 4.46)	0.022
Percent non-calcified plaque volume	1.83 (0.70 to 2.96)	0.002
	1.29 (0.18 to 2.39)	0.023
Percent calcified plaque volume	1.56 (0.45 to 2.66)	0.006
	1.14 (0.04 to 2.24)	0.044
Follow-up imaging (10 years)		
Percent atheroma volume	5.49 (2.53 to 8.45)	0.000
	4.72 (1.83 to 7.61)	0.002
Percent non-calcified plaque volume	2.57 (1.22 to 3.93)	0.000
	2.36 (1.02 to 3.70)	0.001
Percent calcified plaque volume	2.57 (1.22 to 3.93)	0.000
	2.36 (1.02 to 3.70)	0.001
Change (delta)		
Percent atheroma volume	4.41 (2.81 to 6.01)	0.000
	3.78 (2.18 to 5.38)	0.000
	2.97 (1.51 to 4.42)	0.000
Percent non-calcified plaque volume	1.68 (0.91 to 2.45)	0.000
	1.56 (0.74 to 2.38)	0.000
	1.45 (0.63 to 2.27)	0.001
Percent calcified plaque volume	2.73 (1.58 to 3.89)	0.000
	2.22 (1.05 to 3.38)	0.000
	1.78 (0.70 to 2.87)	0.001

Shown are beta coefficients for Type 2 Diabetes Mellitus compared to no Diabetes Mellitus from linear regression models. Adjusted models account for sex, age, and clinical risk factors, which include body mass index, systolic blood pressure, LDL cholesterol, lipoprotein(a), triglycerides, hypertension, hypercholesterolemia, smoking, family history of coronary artery disease, and statin use. Changes were calculated as the difference between follow-up and baseline values.