Cardiac CT
Angiogram & Rapid Cardiac Care
Heart Health, Fast Tracked!!!

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THIS IS MODERN MEDICINE

Burden of coronary artery disease

An estimated 17 million people die yearly of cardiovascular diseases. Of these deaths, an estimated 7.4 million were due to coronary heart disease

Cardiac disease remains responsible for about one-third of all deaths in individuals over age 35

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Rationale for timely detection

Advanced obstructive coronary heart disease (CHD) can exist with minimal or no symptoms

The first presentation of Coronary heart disease can be catastrophic…

Sudden cardiac death

Acute MI

The detection at subclinical stages might permit the identification of subjects at increased risk of a cardiac event

1.Patterns of coronary heart disease morbidity and mortality in the sexes: a 26-year follow-up of the Framingham population. Lerner DJ, Kannel WB Am Heart J. 1986;111(2):383

2. Clinical practice. Selecting asymptomatic patients for coronary computed tomography or electrocardiographic exercise testing. Greenland P, Gaziano JM N Engl J Med. 2003;349(5):465

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Cardiac CT Angiogram (CCTA) *Leads the Way…*

HOW IT WORKS

- Non-invasive imaging with IV contrast to visualize coronary arteries
- ECG-gated acquisition minimizes cardiac motion artifacts
- Assesses: stenosis severity, plaque burden, cardiac structure
- Assesses extracardiac structures, mediastinum, lungs, pericardium
- Best test for the assessment of coronary anomalies

DIAGNOSTIC ACCURACY

- Sensitivity: 90–99% Specificity:74–93%
- **Negative Predictive Value**: >99%
- CTCA detected/ruled out blockages in **91%** vs stress testing **69%**

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Refs: NICE CG95 (2016); ESC Guidelines (2024); AHA/ACC (2024); NIH PMC (2025)

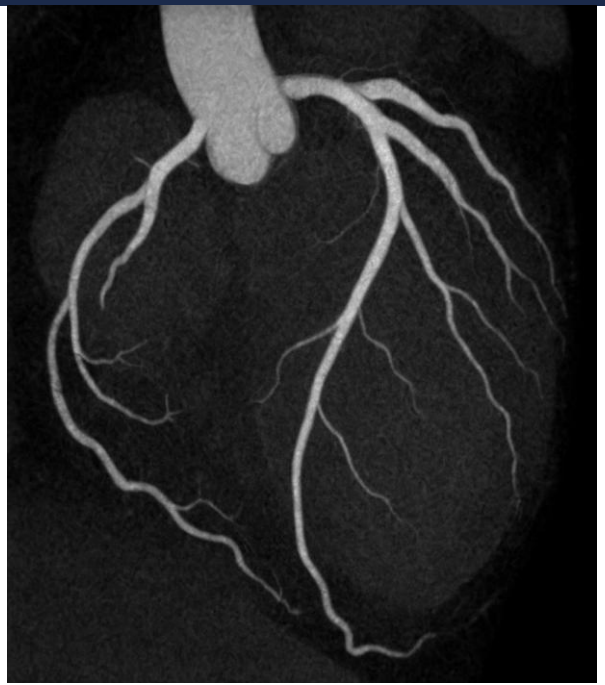
Who Benefits from CCTA?

SUITABLE PATIENTS

- Stable chest pain: New-onset, suspected cardiac origin
- Low-to-intermediate risk patients
- Typical or atypical angina symptoms
- Ruling out CAD would change management

WHEN TO REFER

1. New-onset stable chest pain, suspected cardiac origin
2. Atypical chest pain requiring CAD exclusion
3. Low-to-intermediate pre-test probability of CAD
4. Inconclusive stress test results
5. Risk stratification with multiple risk factors (calcium scoring)



Normal coronary CT angiogram

Refs: NICE CG95 (2016); ESC Guidelines (2024); NHS England (2023)

Diagnostic Accuracy

MODALITY	SENSITIVITY	SPECIFICITY	RADIATION	KEY ADVANTAGE
★ CCTA	90–99%	74–93%	2.9–9.6 mSv	NPV >99%
Stress ECG	45–50%	85–90%	0 mSv	Widely available
Nuclear MPI (SPECT)	73–92%	63–87%	~27 mSv	Functional assessment
Invasive Angiography	Gold standard	Gold standard	~5.6 mSv	Allows intervention
Stress Echo	80–85%	80–88%	0 mSv	No radiation, functional

☢ CCTA: 2.9–9.6 mSv

Refs: NIH PMC (2025); AHA Journals (2023); ACC (2015); JAMA Network Open (2020)

GP REFERRAL PATHWAY

- RACPC/Clinics
- GPs refer direct **healthlink**
- Time From referral to test **under 2 weeks**
- Requirements: **U&E's +/- E.C.G**

- Max reporting timeframe: **5-7 Days**
- CT scan duration: only **10–15 minutes**

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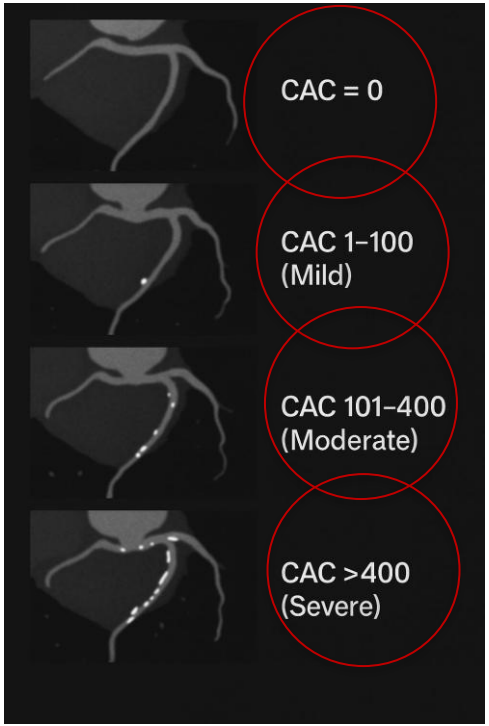
Coronary Artery Calcium Score — A Powerful Risk Predictor

WHAT IS CAC SCORING?

- Non-contrast CT quantifying coronary calcification in Agatston Units
- ~5 min scan, ~1 mSv radiation (less than a mammogram)



RISK CATEGORIES

CAC Score	Category	Clinical Implication
0	No calcification	15-year warranty against mortality
1–99	Mild	1.4× increased risk vs score 0
100–399	Moderate	**Consider INTENSIVE statin therapy + Aspirin**
≥400	Severe	Aggressive management needed

CAC=0 confers a **15-year warranty** against mortality

CAC = 0: The 15-Year Warranty Period

THE POWER OF A ZERO SCORE

- Unaffected by age or gender
- High-risk patients: shorter warranty of **5–6 years**
- Recommended rescan interval: **3–7 years**

CAC=0: 15-year cumulative mortality **4.7%** (annual <0.3%), vs **14.6%** for CAC>0.

Annual mortality <1%; held >15 years regardless of age, sex, or risk score.

MESA STUDY MORTALITY BY CAC SCORE

- CAC = 0: mortality 0.52%
- CAC 1–10: mortality 1.06%
- CAC >10: mortality 3.96%

CAC Score	Prevalence of Obstructive CAD	Study/Source
0	0–4.1%	DISCHARGE trial (n=1749): 4.1% (95% CI: 2.8–5.8%)
1–99	10–20%	CONFIRM registry, RF-CL/CACS-CL models ahajournals+1
100–399	30–50%	CAC-CL model validation (AUC 0.85); higher PTP tctmd+1
≥400	>70–76%	DISCHARGE: 76.1% (95% CI: 70.3–81.2%); nearly all patients >50% likelihood nfa.elsevierpure+2

Agatston Score — Coronary Calcification

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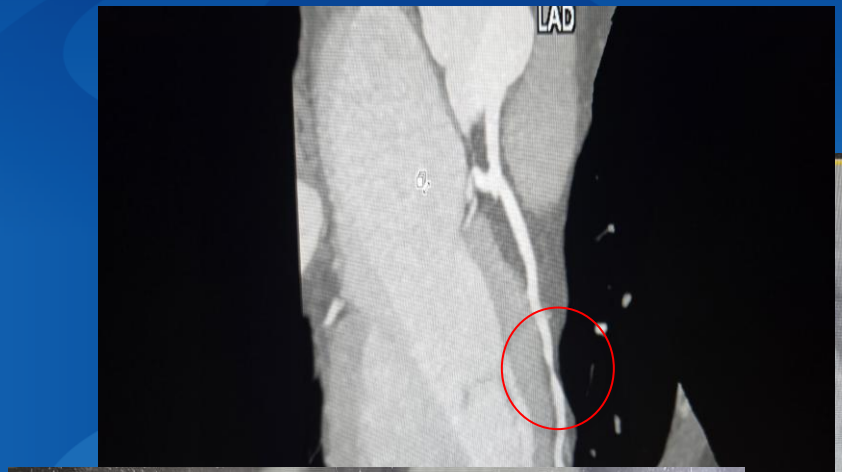
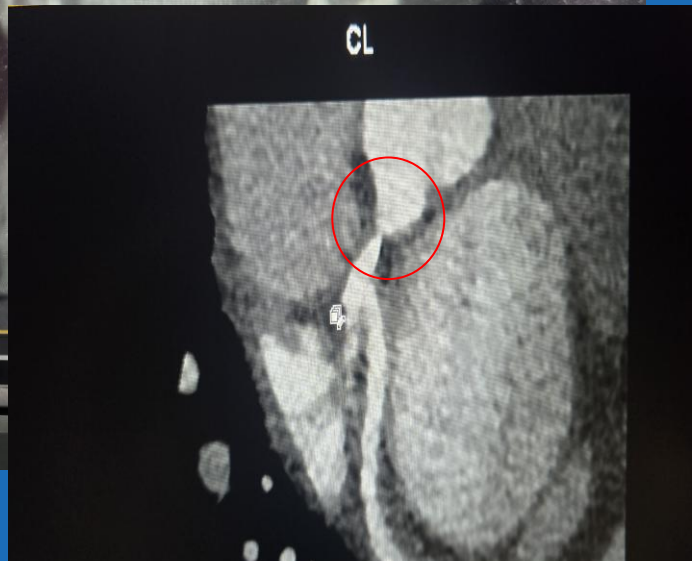
Refs: Blaha MJ et al., Circulation 2019; McClelland RL et al., JAMA 2015; Detrano R et al., NEJM 2008; ACC (2024)

Is calcium score ALONE enough…?





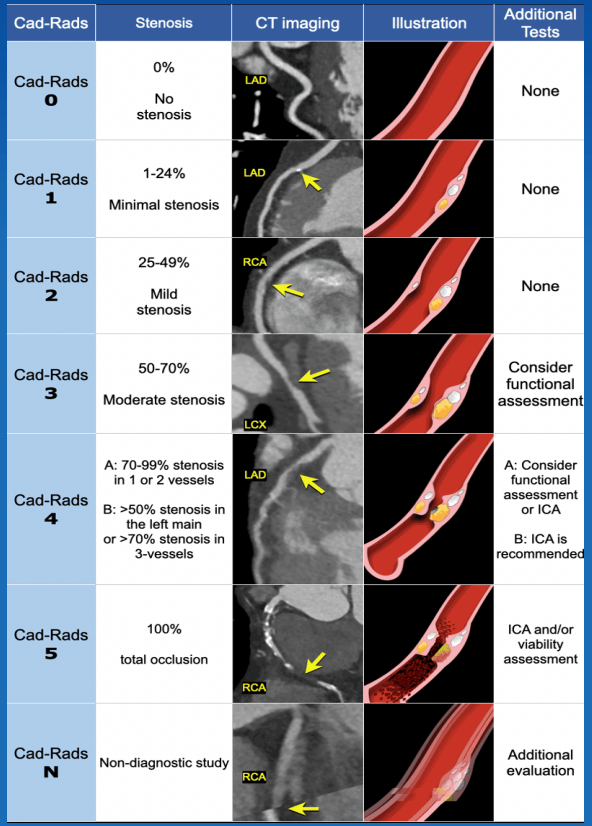
The Evidence Base

TRIAL / STUDY	KEY FINDING	STATISTIC
SCOT-HEART	MI reduction with CCTA	41% reduction; HR 0.59 (p=0.004)
PROMISE	CCTA vs functional testing	Comparable outcomes; safely rules out disease
CONFIRM	Obstructive CAD mortality	4.1% at 2.5 years
CONFIRM	Non-obstructive CAD (>1 segment)	HR 1.73 (p=0.025) for mortality
MESA	CAC C-statistic	0.76 for CV event prediction
MESA	CAC = 0 mortality	0.52%
MESA	CAC >10 mortality	3.96%

- **CCTA is the only non-invasive test proven in an RCT to reduce MI (SCOT-HEART)**
- CAC scoring provides independent prognostic value beyond traditional risk factors

Refs: Newby DE et al., NEJM 2018; Douglas PS et al., NEJM 2015; Chow BJ et al., Circulation 2011; JAMA 2023

Degree	Luminal stenosis
No stenosis	0%
Minimal	1–24%
Mild	25–49%
Moderate	50–69%
Severe	70–99%
Occluded	100%



SCCT/CAD-RADS stenosis grading

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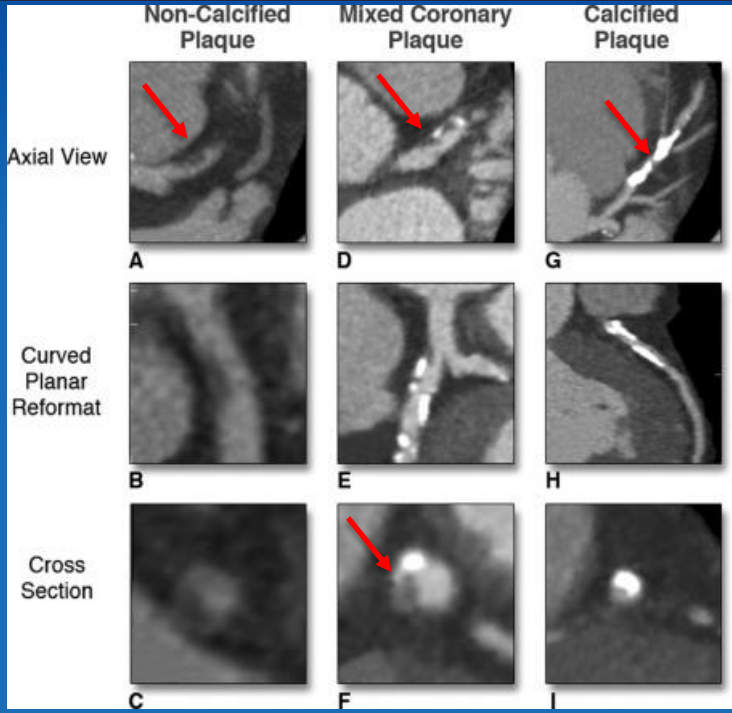
CCTA Findings → Treatment: Non-Obstructive CAD

Non-obstructive CAD = **higher risk** **vs no CAD**

CCTA more decisive for statin decisions than clinical risk alone

CONFIRM: >1 segment involvement: (p=0.025) HR 1.73



RECOMMENDED MANAGEMENT

- ✓ Lifestyle modification (smoking cessation, diet, exercise)
- ✓ **Statin therapy initiation — even for non-obstructive disease**
- ✓ Blood pressure optimization
- ✓ Consider aspirin in selected patients
- ✓ Regular follow-up and risk factor monitoring

ACTION POINT

Any plaque on CCTA → **consider preventive therapy**

Presence of plaque matters — **no specific threshold required to initiate treatment**

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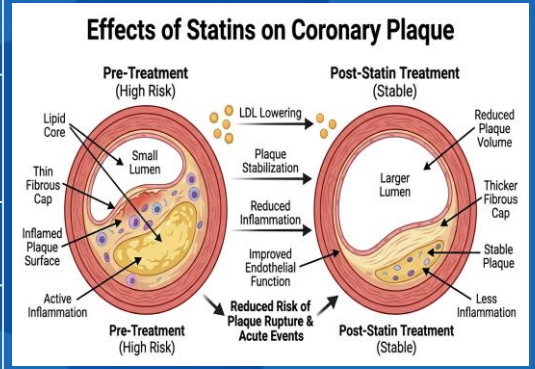
Refs: AHA Journals (2025); ESC Guidelines (2024); Chow BJ et al., Circulation 2011; NICE CG95

But my cholesterol is normal why do I need to go on statins?

Effect	How it helps coronary disease
Plaque stabilization	Thickens fibrous cap, reduces rupture risk (even at similar LDL levels) yalemedicine+1
Anti-inflammatory	Lowers CRP, stabilizes macrophages in plaque; JUPITER showed benefit in normal LDL/high CRP pmc.ncbi.nlm.nih+1
Endothelial function	Boosts nitric oxide, improves vasodilation med.stanford+1
Antithrombotic	Reduces platelet aggregation, lowers tissue factor expression pmc.ncbi.nlm.nih
Antioxidant	Decreases LDL oxidation, limits foam cell formation pmc.ncbi.nlm.nih



Will the plaque clear out with statins??

Plaque progression typically **stops** at LDL-C **<1.8 mmol/L** (70 mg/dL), as seen in IVUS trials like REVERSAL/ASTEROID.

Plaque Regression requires lower levels, such as **<1.6 mmol/L** in ASTEROID or **<1.4 mmol/L** in RIPPER/GLAGOV,

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Take-Home Messages

1. **CCTA** sensitivity 90–99%, Negative predictive valve >99%
2. SCOT-HEART: **41% MI reduction** — HR 0.59, p=0.004
3. CAC=0 = **15-year warranty** against cardiac mortality but **calcium score alone is not enough**
4. Non-obstructive CAD matters — any plaque, **WARRANTS STATINS**
5. Aim for an LDL below **1.7 mmol/l**, and most ideally below **1.5 mmol/l**
6. Consider repeating the CTCA **IN 3-7 YEARS** DEPENDING ON RISK FACTOR profile and extent of disease

CCTA: Fast, accurate, cost-effective & guideline-recommended

Refs: NICE CG95 (2016); Newby DE et al., NEJM 2018; Blaha MJ et al., Circulation 2019; NHS England (2023)

FFR-CT & CT Perfusion

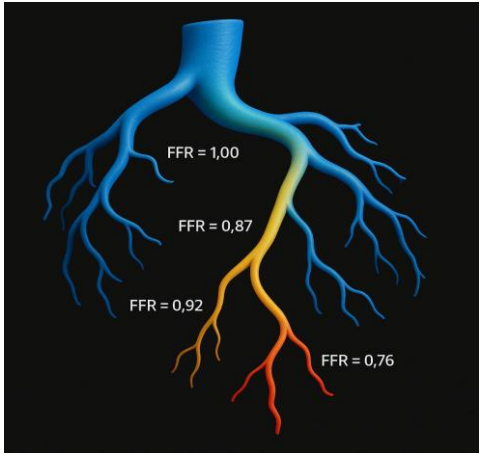
FFR-CT (HEARTFLOW TECHNOLOGY)

- Combines anatomical + physiological data non-invasively
- Diagnostic accuracy: **above 90%**
- Identifies flow-limiting lesions **(FFR≤0.8) without catheterization**

Particularly accurate for FFR-CT >0.90 and <0.49

CT PERFUSION IMAGING

- Anatomical + functional assessment in a single scan
- Photon-counting CT enabling higher quality perfusion
- Hybrid SPECT/CT for attenuation correction
- AI integration for precise interpretation



HeartFlow FFR-CT — Color-coded coronary flow analysis

Refs: NIH PMC (2025); HeartFlow; AHA Journals (2024); NICE; JACC (2025)

CCTA IS AN ADJUNT TO OUR **Rapid Access Cardiology Clinic (RACC)**

Aims of RACC

- Safely and efficiently **identify patients** with or at risk of cardiac disease.
- To provide rapid referral service and **timely assessment** of patients with symptoms suggestive of cardiac disease who require urgent cardiac consultation.
- Timely cardiac interventions and **attendance by experienced Cardiac Nurse Specialists** and **immediate access to a Cardiologist**.

RACC is ideal for…

- Investigation of Palpitations
- New or recurring arrythmias
- New or recurring chest pain

"RACC is suitable for all cardiac patients who are clinically and hemodynamically stable"

- Assessment of valvular conditions
- Cardiac screening & risk assessment

To summarise RACC…

- Any **patients with cardiac issues** can be referred to RACC who are Clinically and Hemodynamically stable.

- Patients referred to emergency department **can still be referred to RACC** for a same day assessment or assessment at a later date, after clinical review in ED.

- RACC is a **one stop for all patients cardiac** offering baseline and specialist cardiac investigations in a timely manner.

Wherever you refer, your patient will be looked after, however, referral to the appropriate department ensures the timely management of your patient