

Outcome of 64-slice multi-detector coronary CT angiogram when exercise stress test is equivocal or not possible.

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Background



Rapid Access Chest Pain Clinics

- Altnagelvin RACPC
- Since April 2007, c 2000 patients
 - 74% Negative
 - 12% Positive
 - 11% Equivocal
 - 4% Not done

 - 15%, or 300 patients

Cascade of Tests

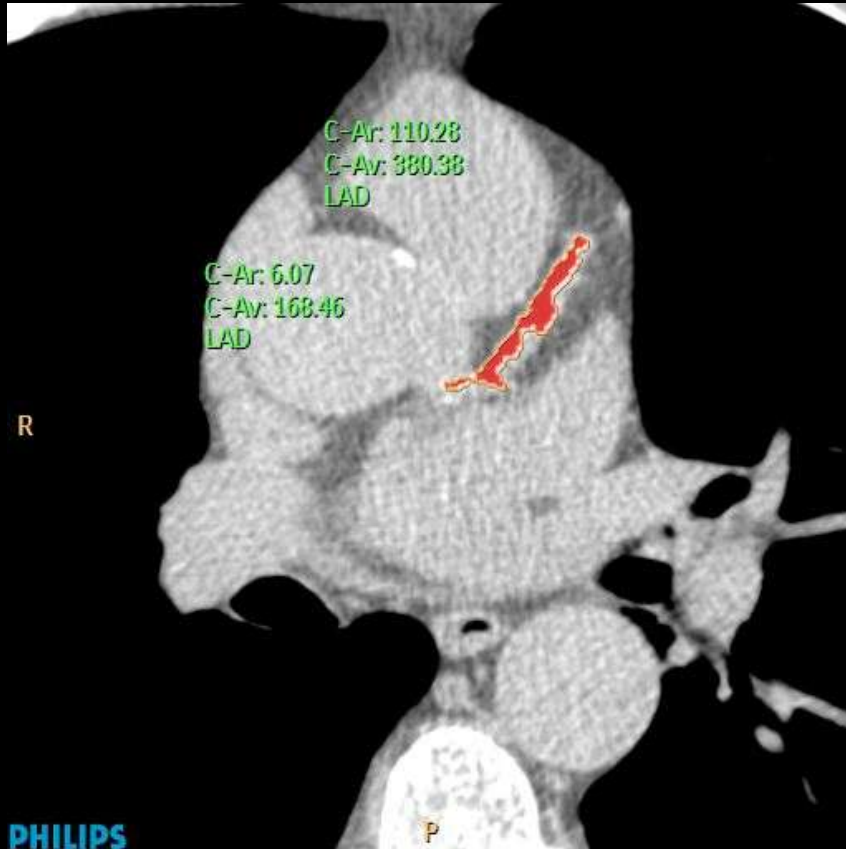
- Level 1
 - Exercise Stress Test
- Level 2 (low or intermediate risk)
 - Dobutamine Stress Echo
 - Myocardial Perfusion Scan
 - **Coronary CT angiogram**
- Level 3 (high risk)
 - Cardiac catheterisation

Radiation

| <u>Procedure /Activity</u> | <u>Dose</u> |
|---|-------------|
| One year of background radiation | 1 mSv |
| One chest X ray | 0.1 mSv |
| Flight across Atlantic | 1 mSv |
| Cardiac Catheterisation | 5 mSv |
| Cardiac CT | 5 - 8 mSv |
| Cardiac CT (prospective ECG triggering) | 3 mSv |
| Myocardial Perfusion Scan | 7 – 10 mSv |

Calcium Score

Low dose (1-2mSv), low resolution

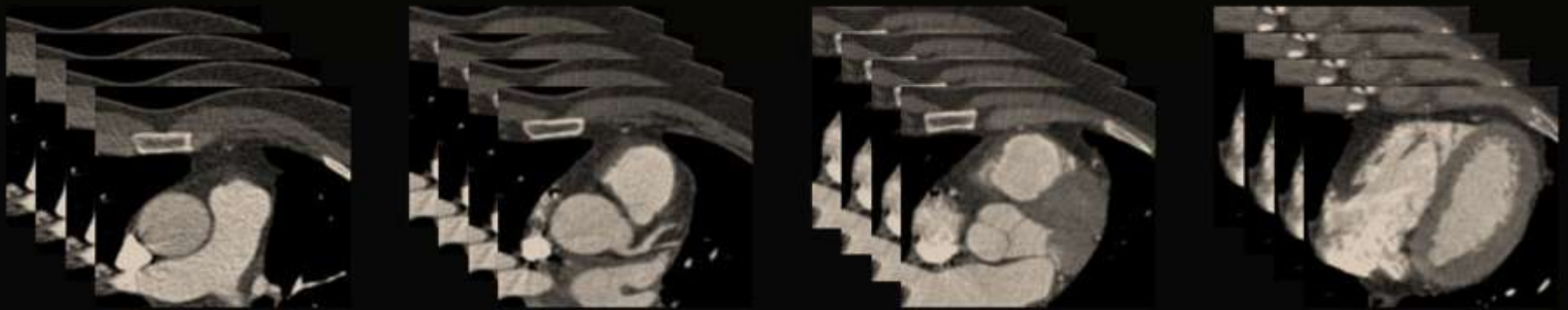
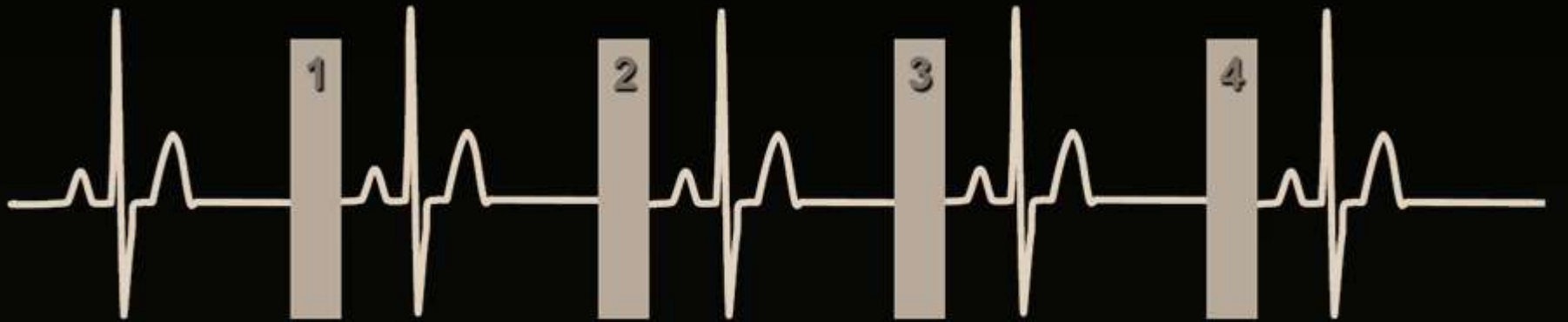


- 25 252 asymptomatic individuals, mean FU of 6.8 yrs. Mean Age 56yrs, 50% male. Mortality 2%
- Score
- 11 to 100 2.2 x RR
- 101 to 299 4.5 x RR
- 300 to 399 6.4 x RR
- 400 to 699 9.2 x RR
- 700 to 999 10.4 x RR
- >1000 12.5 x RR

Long term prognosis associated with CAC. Budoff et al, JACC 2007;49:1860

MSCT Coronary Angiography

Mid-diastolic coronary image reconstruction



Axial Reconstructions



- High resolution, 1mm
- Higher dose 5-8mSv
- Prospective ECG triggering
- 2-3mSv
- Acquisition time 7 secs

Multi-planar and 3D reconstruction



Method

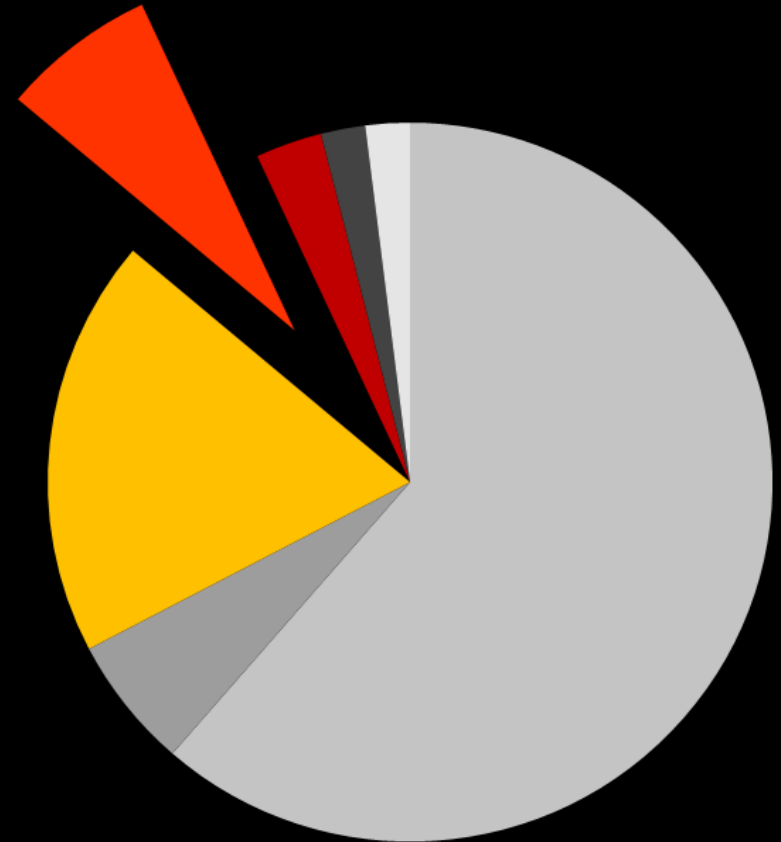
- In this analysis, stent and CABG cases excluded
- Pre-treatment with oral beta-blockade was routinely given or ivabradine
- Intravenous beta-blocker was given pre-test if required
- Aim for HR<64
- Sublingual GTN was given to all
- A calcium scan was performed then contrast study
- Prospective ECG triggering (PET) was installed in month 8 and used if HR was <64bpm

Results



Referral

- 102 patients referred over 18 months
- Mean age 56 (35 -74) 53M, 49F
- 63(62%) had an equivocal EST result
- 6(6%) had an inadequate exercise duration
- 19(19%) had mobility problems
- 7(7%) had LBBB
- 3(3%) had COPD
- 2(2%) had hypertension or LVF
- 2(2%) didn't want to EST



Calcium Scores

| | | | |
|----------------|-----------|------------|--------------------------|
| CAC = 0 | 44 | 43% | Mean age 52, 72%F |
| CAC = 0 - 100 | 73 | 72% | Mean age 55, 59% F |
| CAC =101 - 300 | 12 | 13% | Mean age 60, 33% F |
| CAC > 300 | 17 | 15% | Mean age 63, 29% F |

| Decade | Men | Women |
|--------|----------|----------|
| 30s | 000 (2) | 000 (1) |
| 40s | 038 (7) | 038 (8) |
| 50s | 141 (20) | 082 (19) |
| 60s | 215 (15) | 167 (16) |
| 70s | 668 (9) | 055 (5) |

High calcium scores

- 7 did not have contrast study, cath recommended: Average age 66, 29% F
- Average CAC score = 1085, range 555 - 1796
- 5 HAD CATH
 - 2 x stent
 - 1 x CABG
 - 1 occluded LCx for medical management
 - 1 x medical management
- 1 HAD MYOCARDIAL PERFUSION SCAN
 - Result not through
- 1 TREATED MEDICALLY

Contrast enhanced CT scans

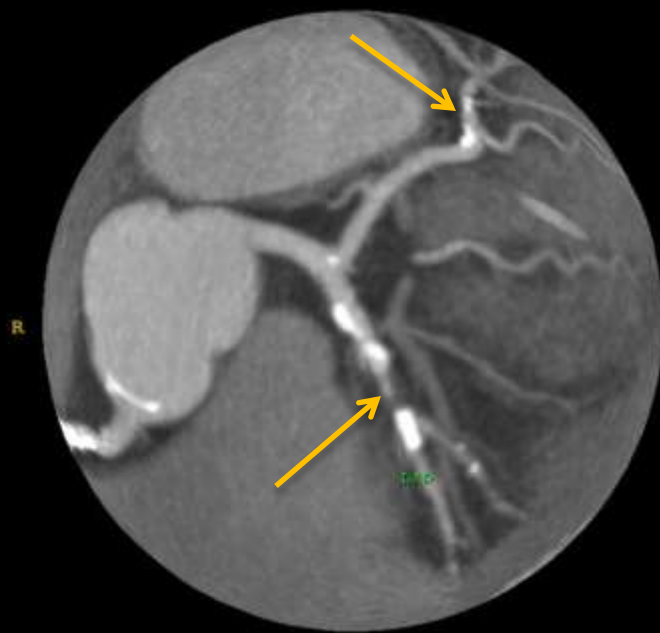
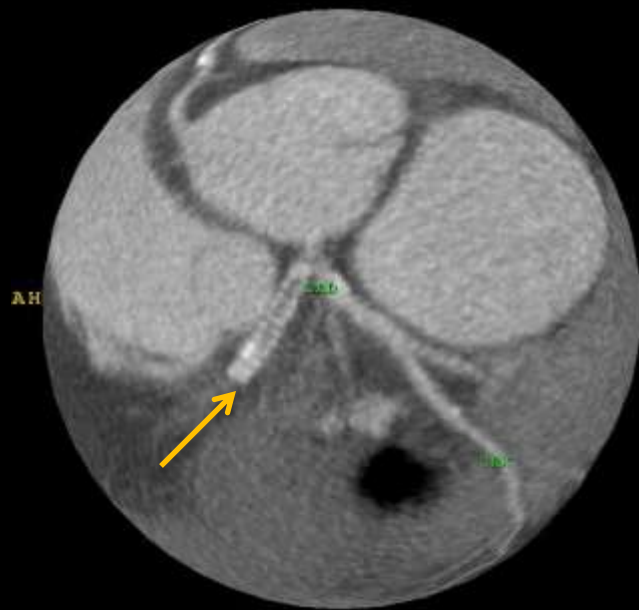
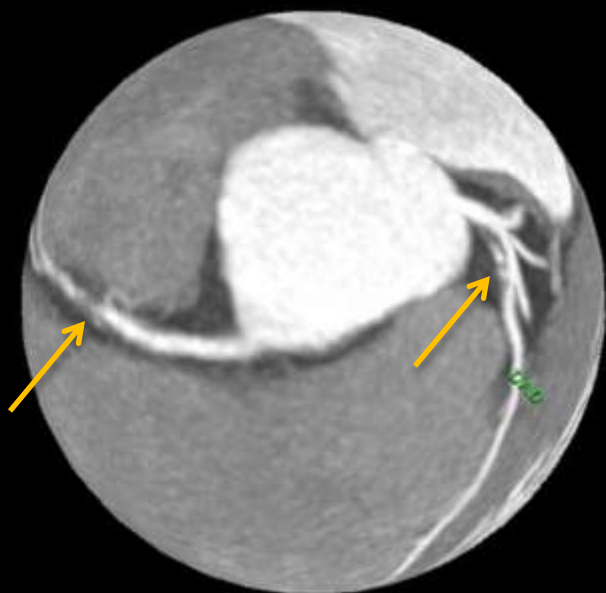
- In 7 cases, calcium score was too high so 95 cases were performed
- One case was unevaluable – leads fell off
- PET was installed in month 8 and used in 38% of patients since installation.

Reporting coronary CT angios

RECOMMENDED QUALITATIVE STENOSIS GRADING

- 0 Normal: Absence of plaque and no luminal stenosis
- 1 Minimal: Plaque with negligible impact on lumen
- 2 Mild: Plaque with no flow-limiting stenosis
- 3 Moderate: Plaque with possible flow-limiting disease
- 4 Severe: Plaque with probable flow-limiting disease
- 5 Occluded

Examples



Outcomes

- 56 (60%) of patients had normal or minimal plaque. Average age 54, 64% F
- 24(26%) patients had mild coronary plaque not requiring catheter study. Average age 58, 33% F
- 14(14%) patients had catheter study recommended for moderate or severe plaque or in 1 case, significant aortic stenosis. Average age 60, 28% F

Aortic Stenosis

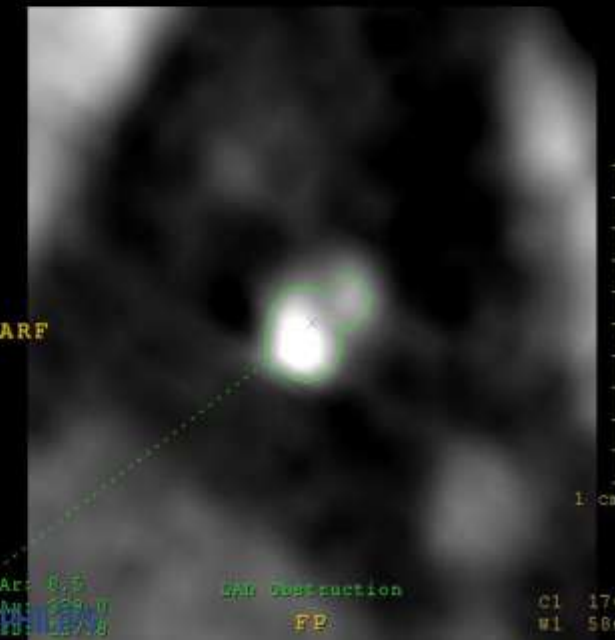


PHILIPS

Enhanced CT:cath correlation

- 14 had cath recommended, 13 for IHD
- 1 case: no follow up
- AGREED WITH CT IN 10 OUT OF 13 (77%) CASES
 - 1 x aortic valve surgery
 - 1 x CABG
 - 6 x stents
 - 1 occluded LCx for medical management
 - 1 x mild RCA for medical management
- OVER-CALLED 2(15%)
 - Managed medically
- UNDER-CALLED 1(7%)
 - Moderate stenosis: stent

Stent to LAD



Conclusions

- 20% of EST patients will require additional tests because EST is equivocal or not possible
- CT CORONARY ANGIOGRAPHY CAN:
- Exclude significant CHD in 60% of patients
- Provide a rationale for medical therapy in 26%
- Suggest a need for cardiac cath in 14 %
- Correctly in 85% with 15% false positives

Acknowledgements

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