Prognostic Value of Cardiac MDCT

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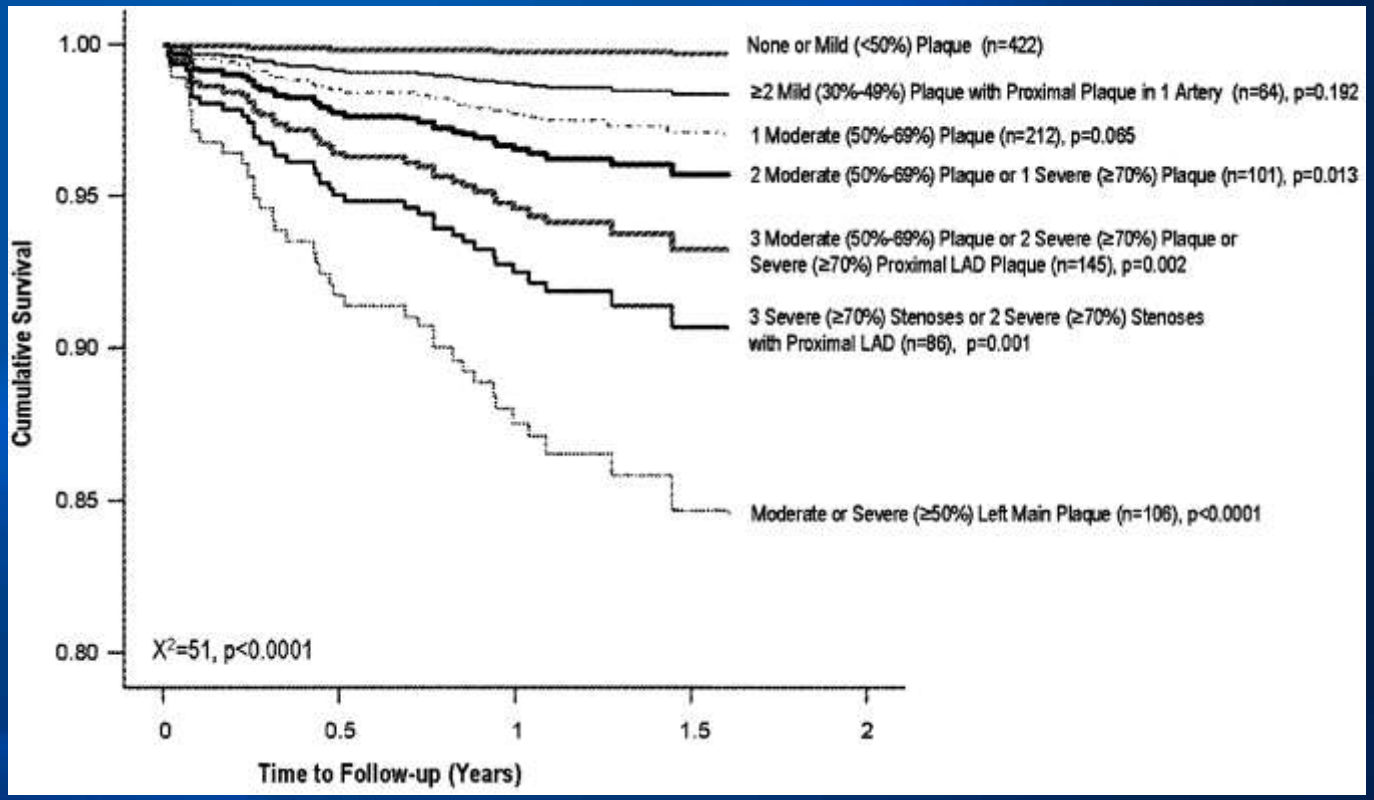
Prognostic Value of Cardiac CT

1. Anatomic assessment of CAD
2. Functional assessment of CAD
3. Plaque type and progress

 **Prognosis**

1. Anatomic Assessment of CAD by CT
- Prognostic value

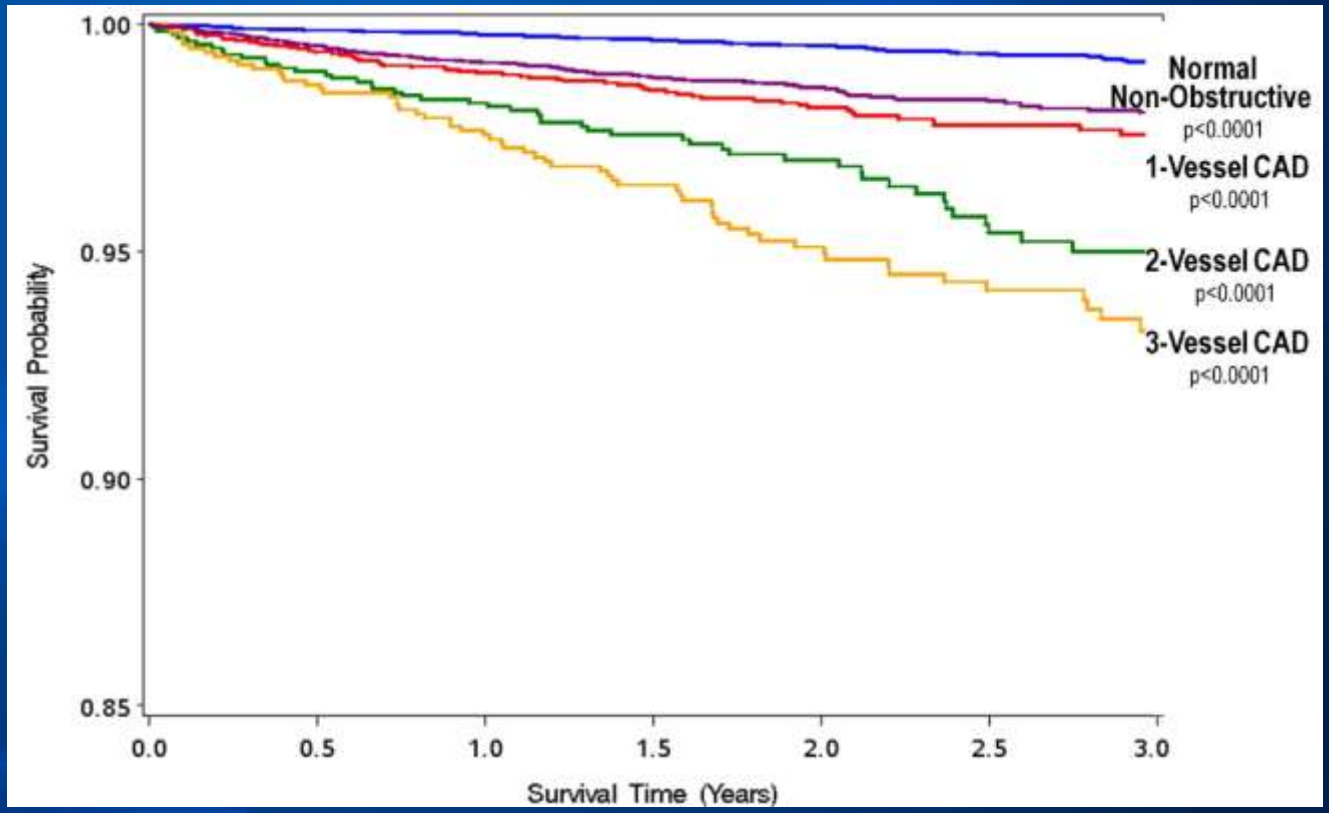
CAD Assessed by CCTA: Early Results



- 1127 symptomatic patients
- 15.3 months F/U, All-cause death
- **CT predictors of death**
  - Proximal LAD stenosis, Number of diseased vessels

Min et al. JACC 2007:1161 - 70

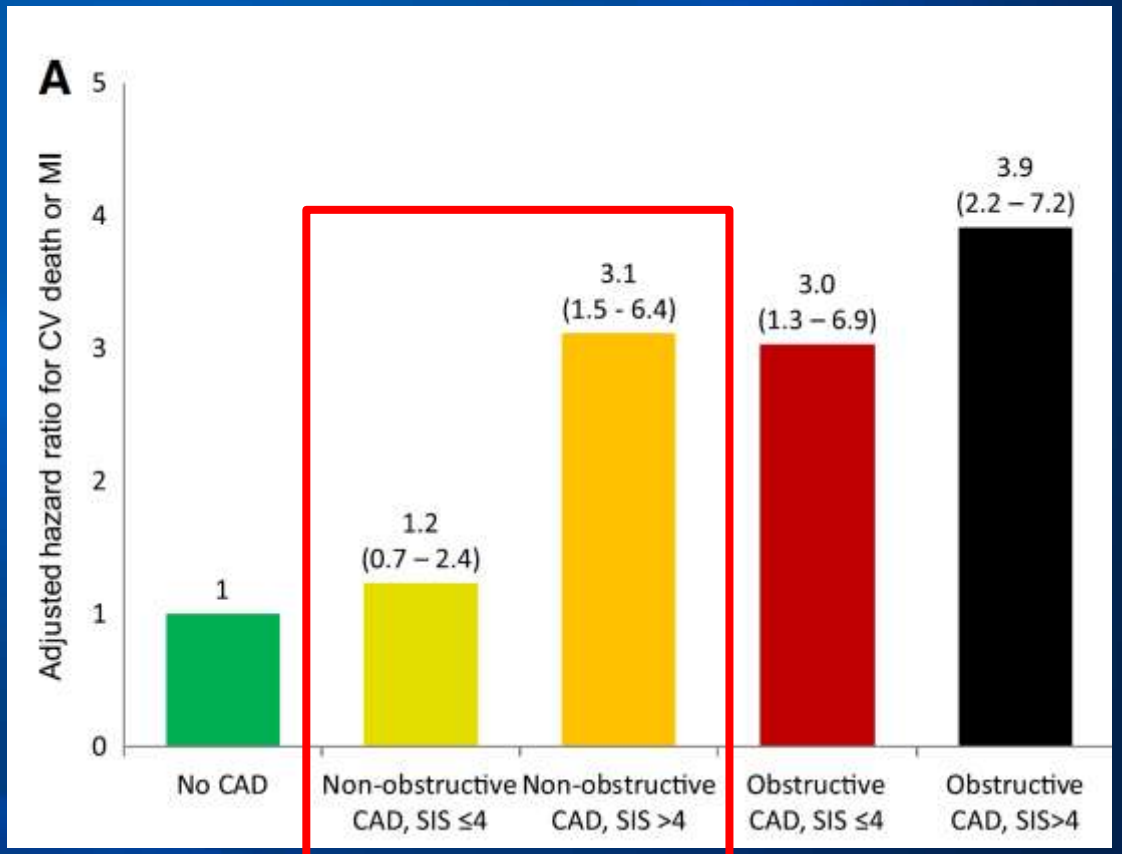
Anatomic Assessment of CAD: CONFIRM Registry



- 23,775 multicenter international cohort, 2.3 years f/u
- Both non-obstructive and obstructive CAD → higher rates of mortality
- **Absence of CAD was associated with a very favorable prognosis**
  - **Death rate 0.28% / year**

Min et al. JACC 2011:849 - 60

Prognostic Value of CCTA: Plaque Extent

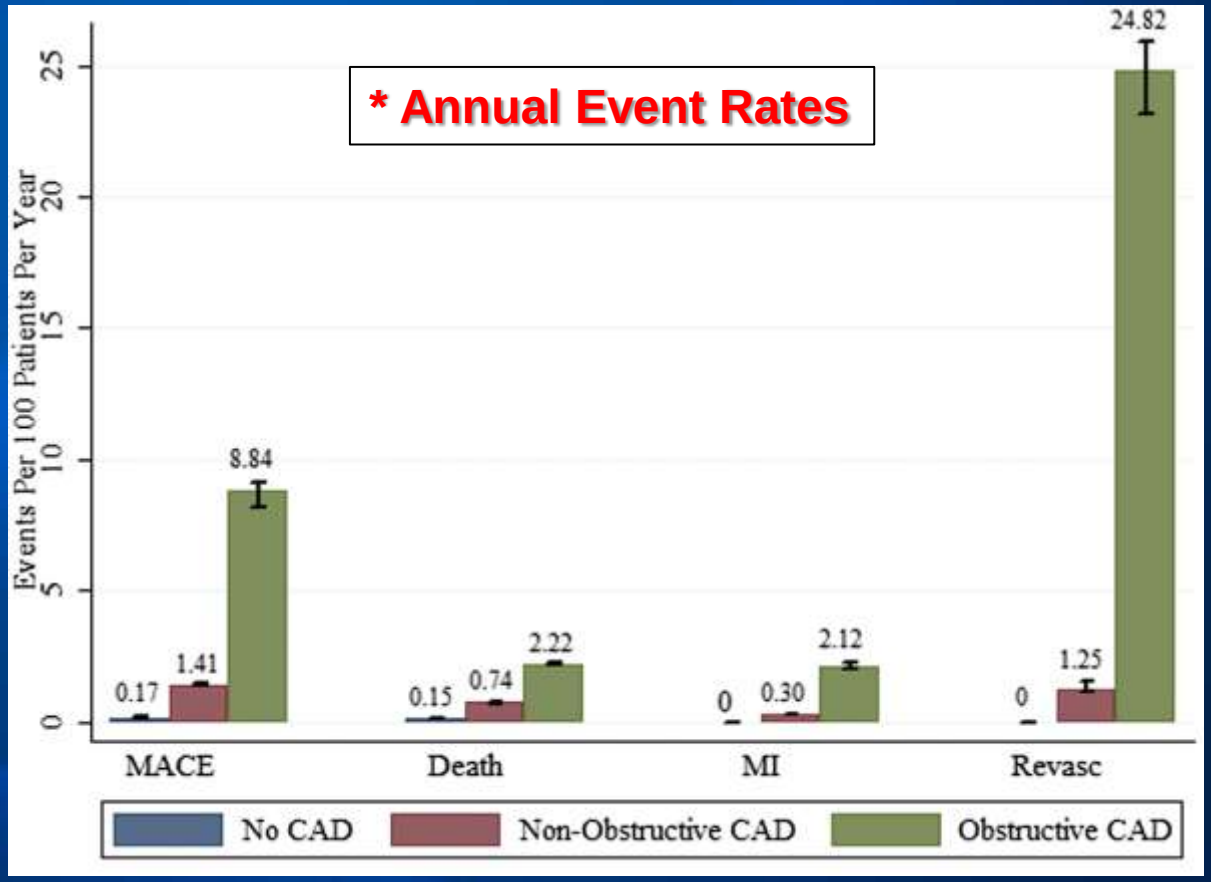


- 3432 patients

Extensive non-obstructive disease experienced the greater risk compared to those with non-extensive obstructive CAD.

Bittencourt et al. Circulation CV img 2014: 282-291

Prognostic Value of CCTA: Meta-Analysis, 2011

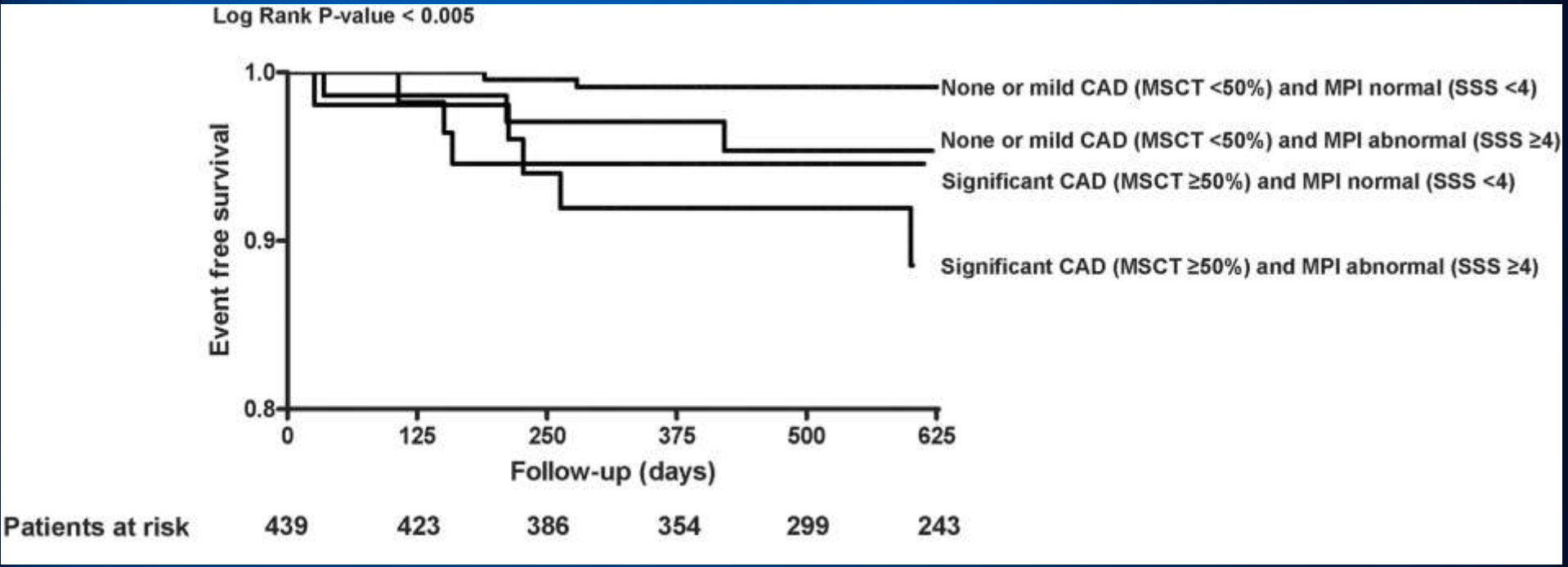


- 18 studies, 9592 patients

Incrementally increasing future MACE with increased CAD by CT

Hulten et al. JACC 2011:1237 - 1247

Prognostic Value of CCTA: Incremental Value over SPECT

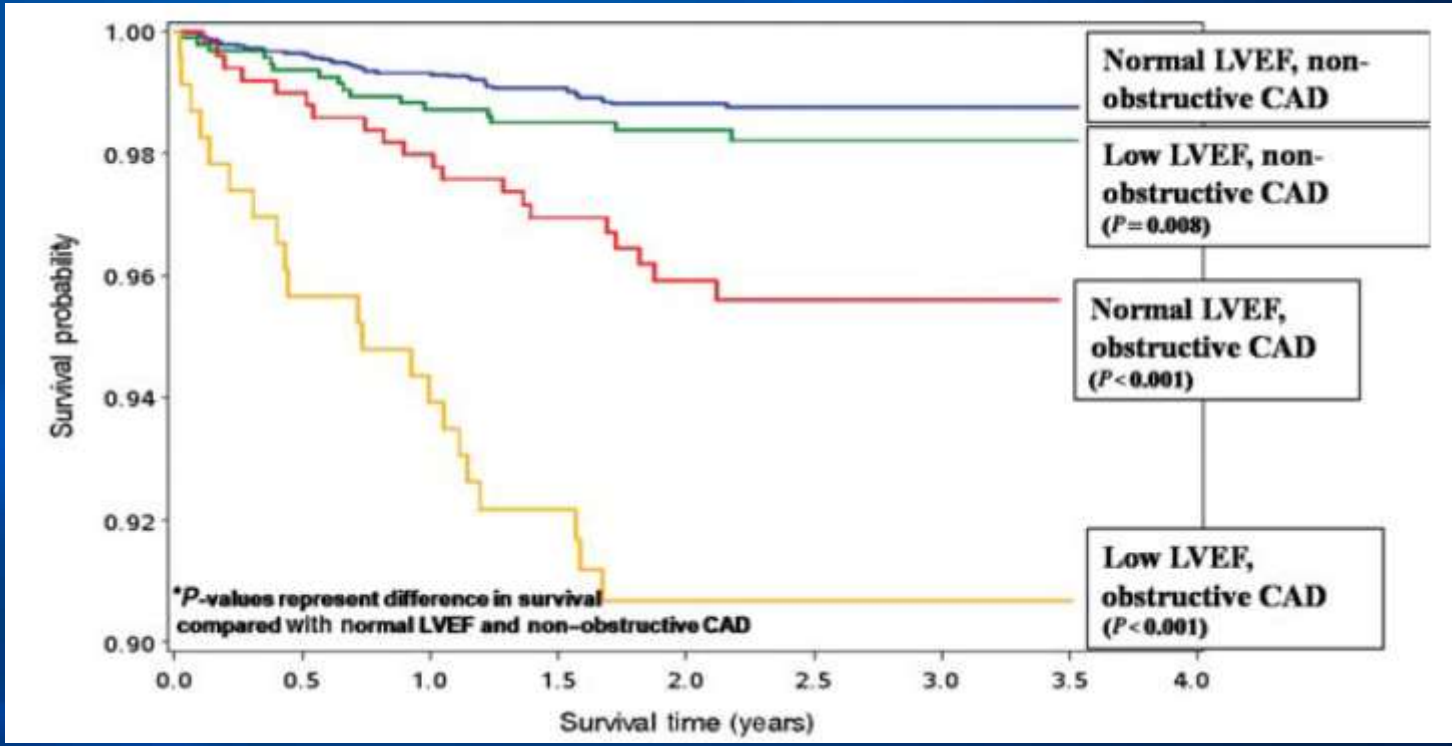


- 541 patients
- End-points: all-death, MI, unstable angina requiring revascularization
- CT was an independent predictor of events and provides incremental prognostic value to SPECT.

→ Combined anatomical and functional assessment may allow improved risk stratification

Werkhoven et al. JACC 2009:623 – 32

Prognostic Value of CCTA: Incremental Value of LVEF

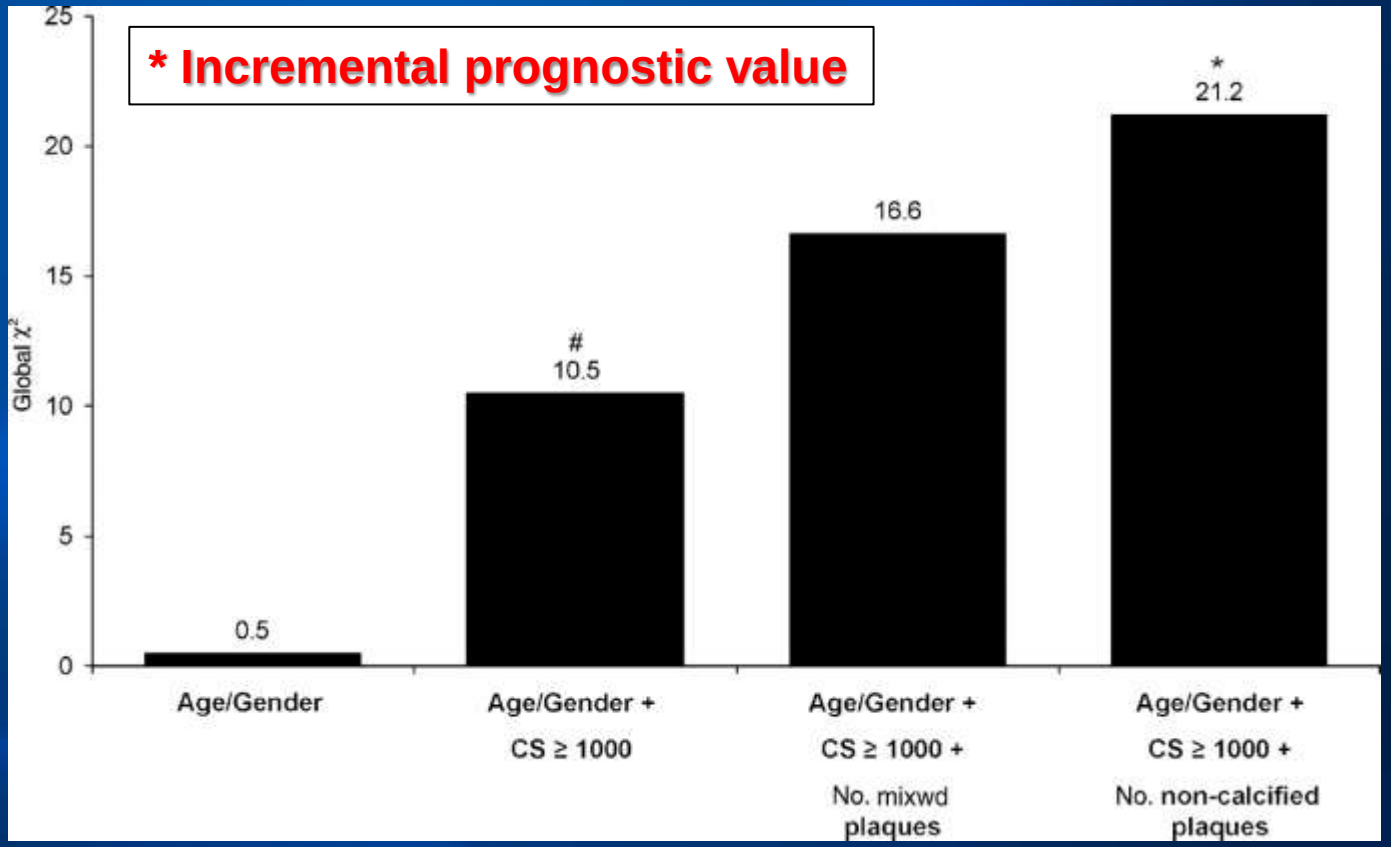


- 5330 patients without known CAD
- CT + CT driven LVEF

The addition of LVEF by CT enhanced risk stratification for death

Min et al. Eur Heart J 2010:1212-1219

Prognostic Value of CCTA: Incremental Value over Calcium Score

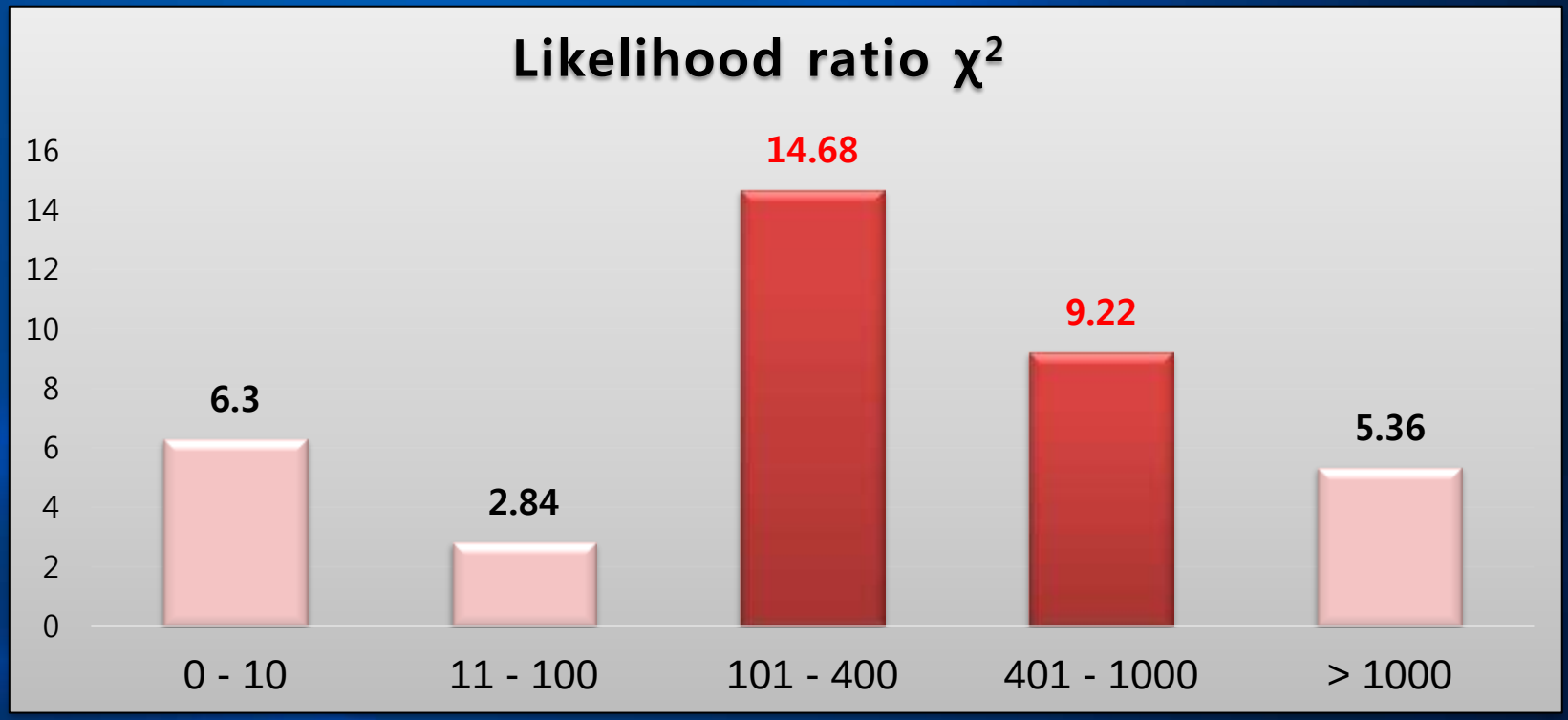


- 432 pts suspected coronary artery disease

CCTA provides additional information to CAC regarding stenosis severity and plaque composition

Van Werkhoven et al. Eur Heart J 2009:2622 - 2629

Incremental Prognostic Value of CT:
Dependence upon CAC Severity

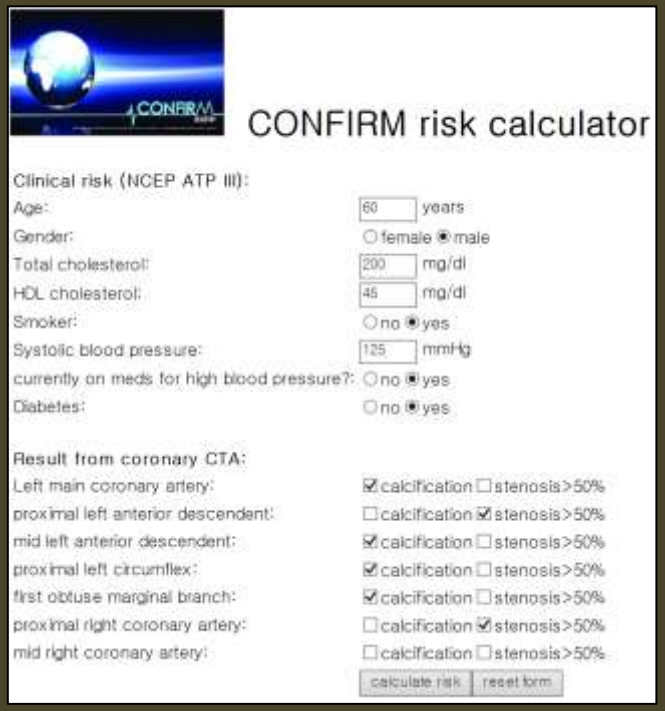


- 3217 asymptomatic pts

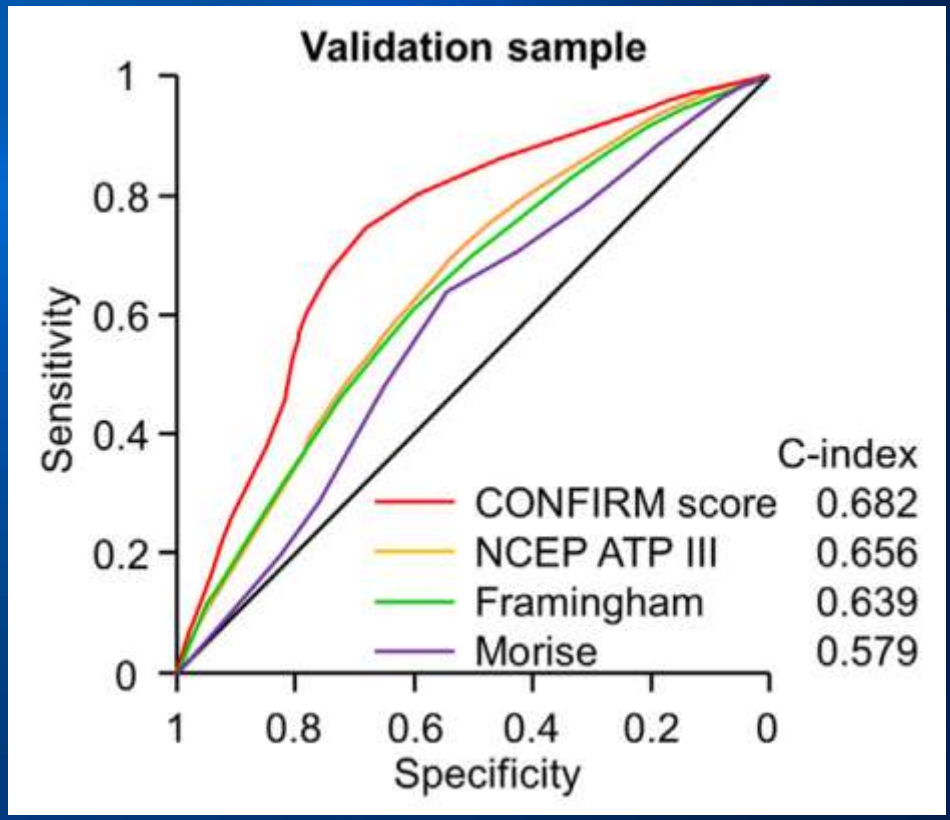
Incremental prognostic utility for prediction of death and MI with moderately high CACs, but not for lower or higher CACs

Cho I et al. Eur Heart J 2015: 501 - 508

Prognostic Value of CCTA: Clinical risk predictors



http://www.ctconfirm.org/risk/



Prognostic score based on CONFIRM registry (CONFIRM score) can improve risk prediction beyond clinical risk scores.

Hadamitzky et al. JACC 2013: 468-76

1. Anatomic Assessment of CAD by CT - Prognostic value

- CAD extent and severity by CT have prognostic implication.
- The prognostic value of CT is incremental to traditional measures of CAD risk assessment including clinical parameters, SPECT, LVEF, and CAC.
- Absence of CAD in CT is associated with a very favorable prognosis.

2. Functional Assessment of CAD by CT
- Prognostic value

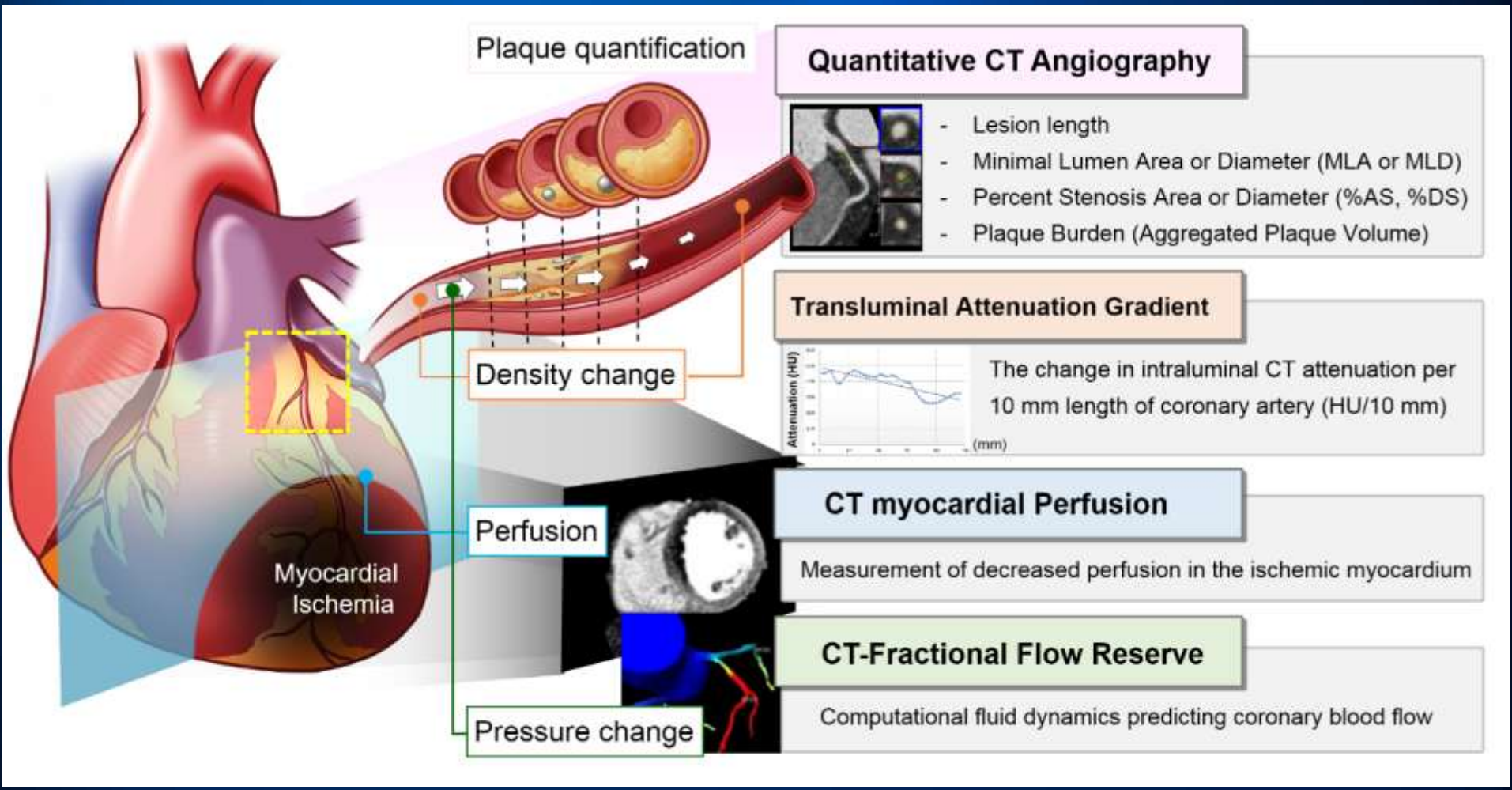
CTA for Prediction of FFR

FFR < 0.80 (n=31)	Sensitivity	Specificity	Accuracy
CTA, Visual score	94	48	64
CTA, Quantitative measurement	45	79	67
CAG, Visual score	55	62	60
CAG, Quantitative measurement	57	69	65

- The anatomical assessment of the hemodynamic significance of coronary stenosis determined by CT and CAG does not correlate well with the functional assessment of FFR

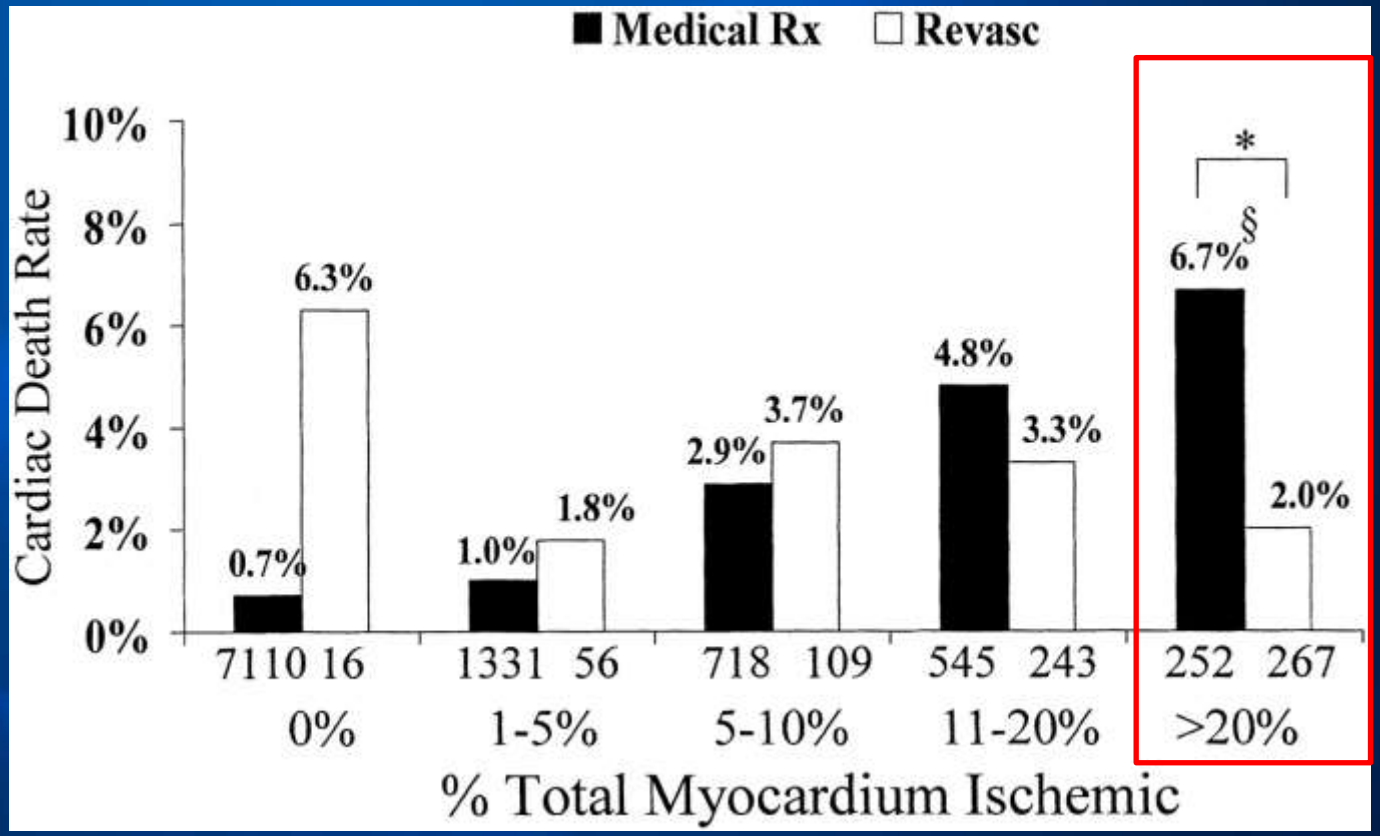
Meijboom W.B. JACC 2008;52:636-43

Functional Assessment of CAD by CT



Koo HJ, Yang DH et al. In submission

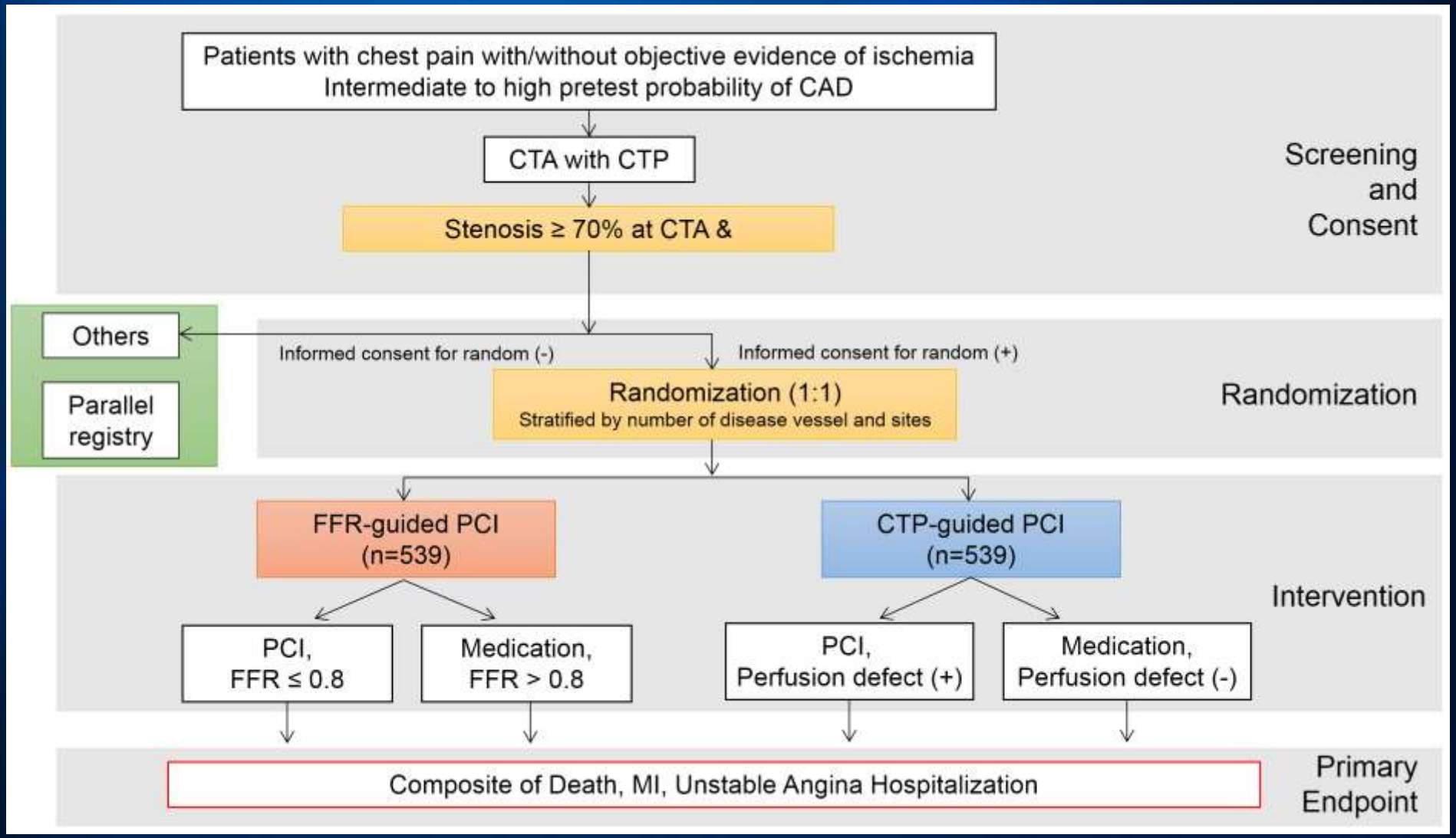
Prognostic Value of SPECT: Treatment Decision



- 10627 pts, No prior MI/revascularization

Hachamovitch et al. Circulation 2003: 2900 - 7

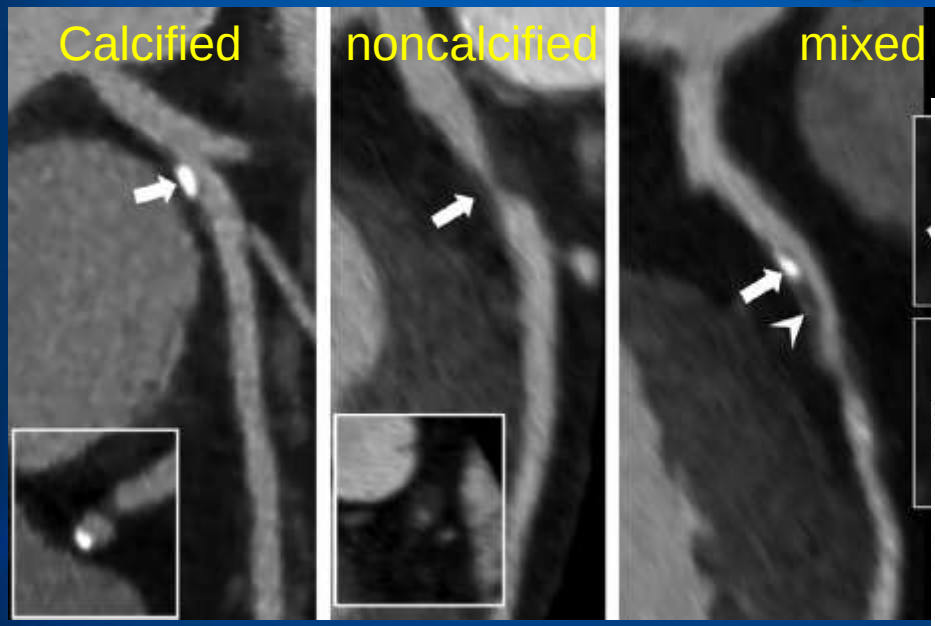
On going CTP-guided Tx. Trial

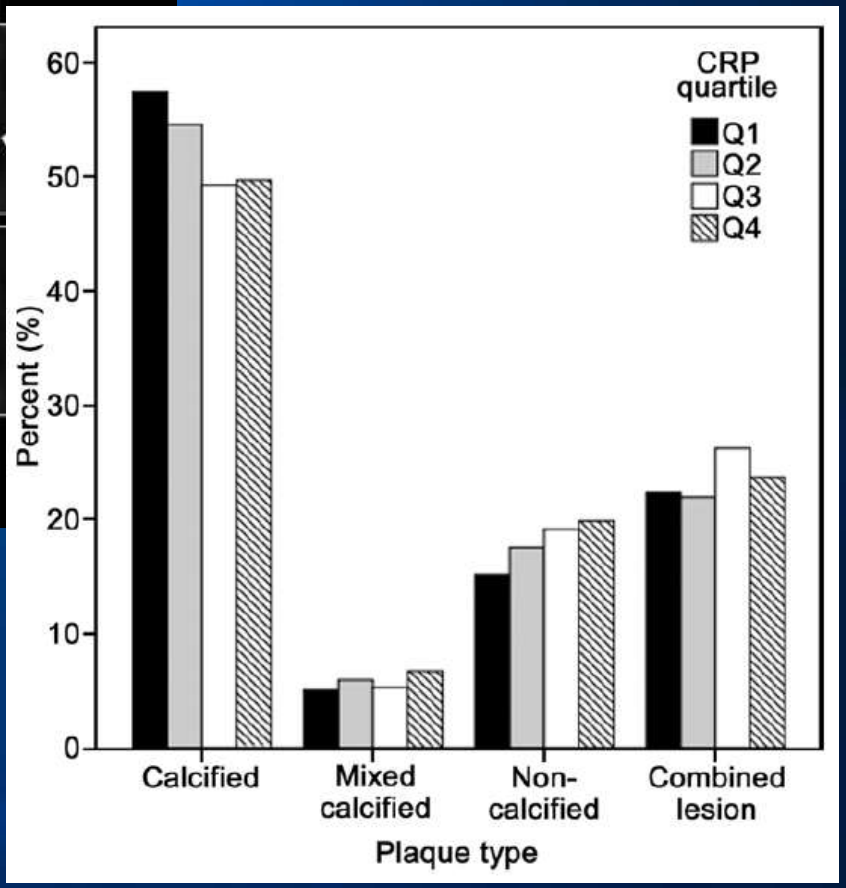


NCT02208388, Clinicaltrials.gov

3. Plaque type and progression assessed by CT
- Prognostic value

Plaque Type by CCTA: Clinical parameters

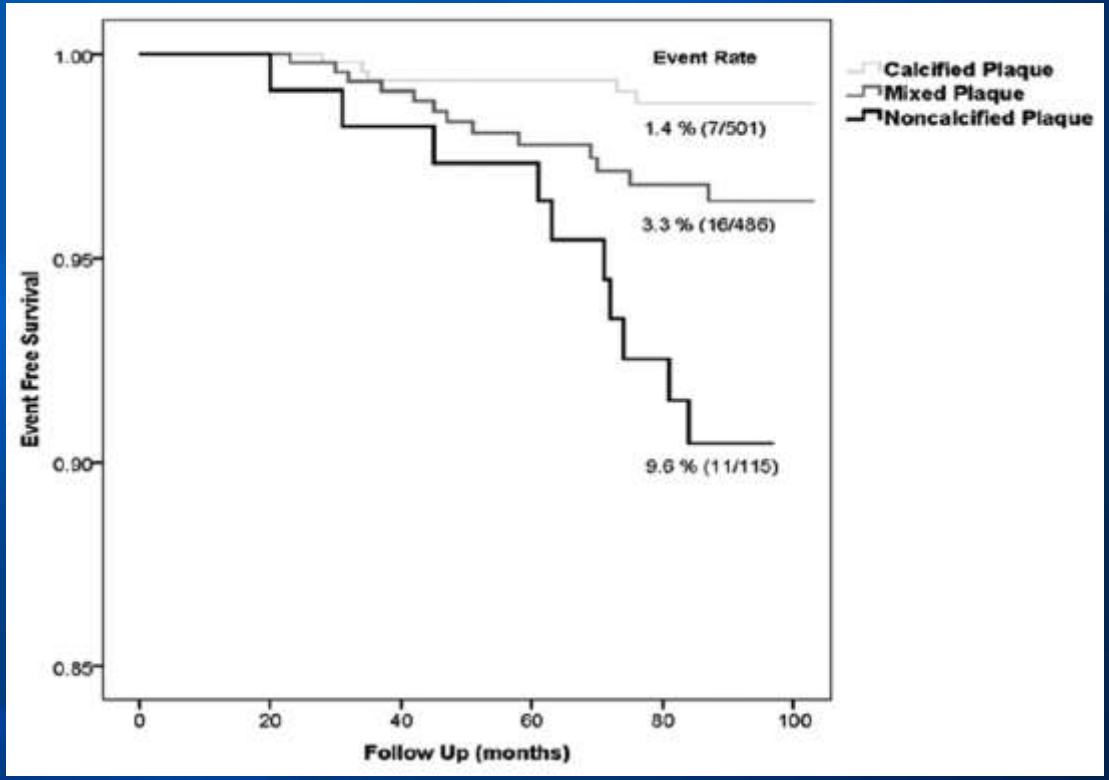




- CPR is associated with noncalcified coronary plaque after adjustment for traditional risk factors
- 2653 asymptomatic subjects

Yang DH et al. Radiology 2014 665-673

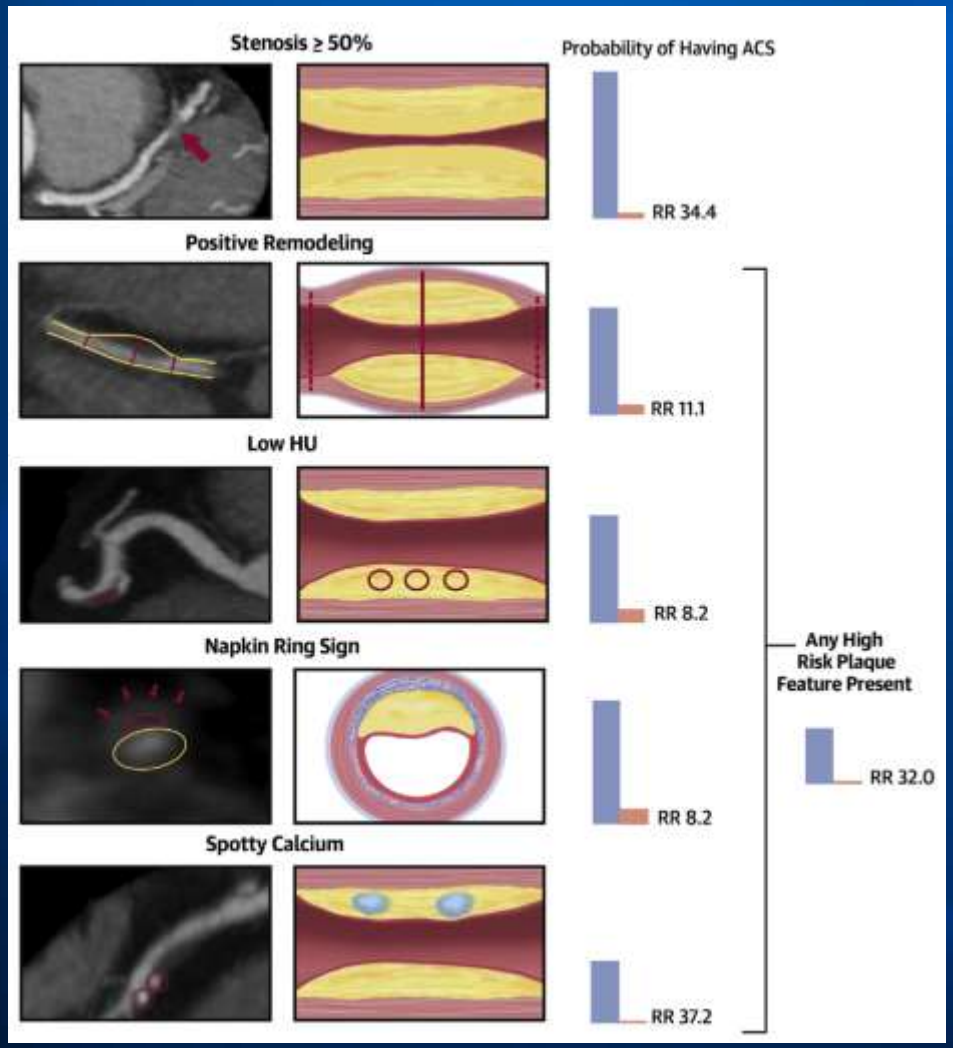
Plaque Type by CCTA: Prognostic Value



- Mixed / Noncalcified plaque provide incremental value in predicting all-cause mortality in symptomatic subjects **with nonobstructive CAD**
- 1102 symptomatic subjects

Ahmadi N et al. Am J Cardiol 2011:10 - 16

High-Risk Plaque by CCTA:
Acute Coronary Syndrome (ROMICAT-II Trial)

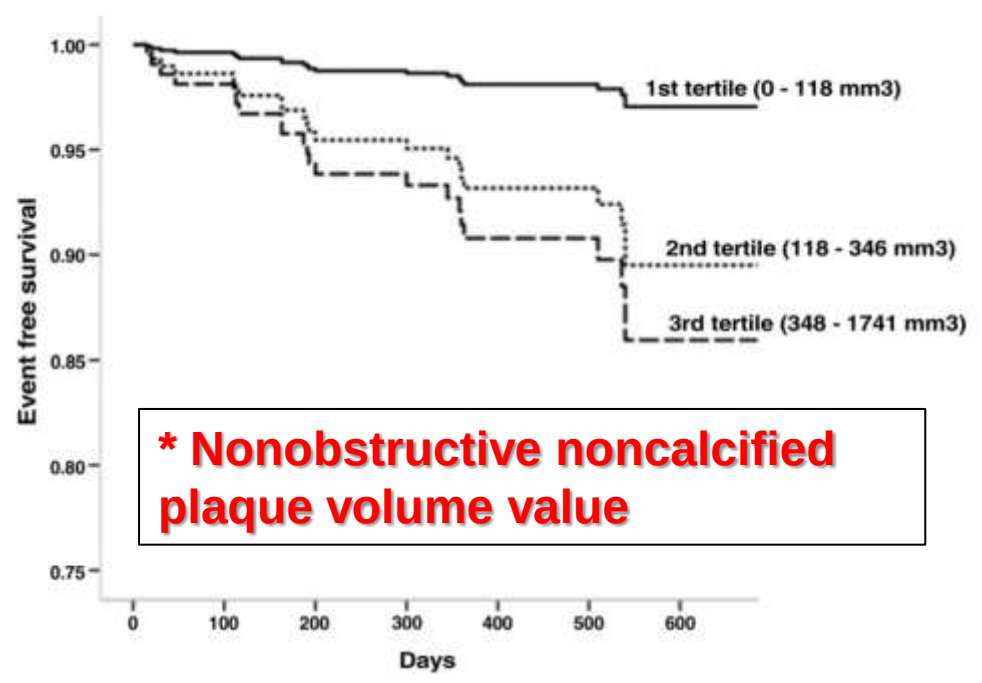


- 472 pts underwent CCTA at ED
- 37 ACS

- High-risk plaques were more frequent in patients with ACS after adjustment for significant stenosis.
- (RR 8.2 ~ RR 37.2)

Puchner SB et al. JACC 2014:684-92

Nonobstructive CAD by CCTA:
Prognostic value after Acute Coronary Event



- 312 pts with NSTEMI
- 23 cardiac events during 16 months f/u

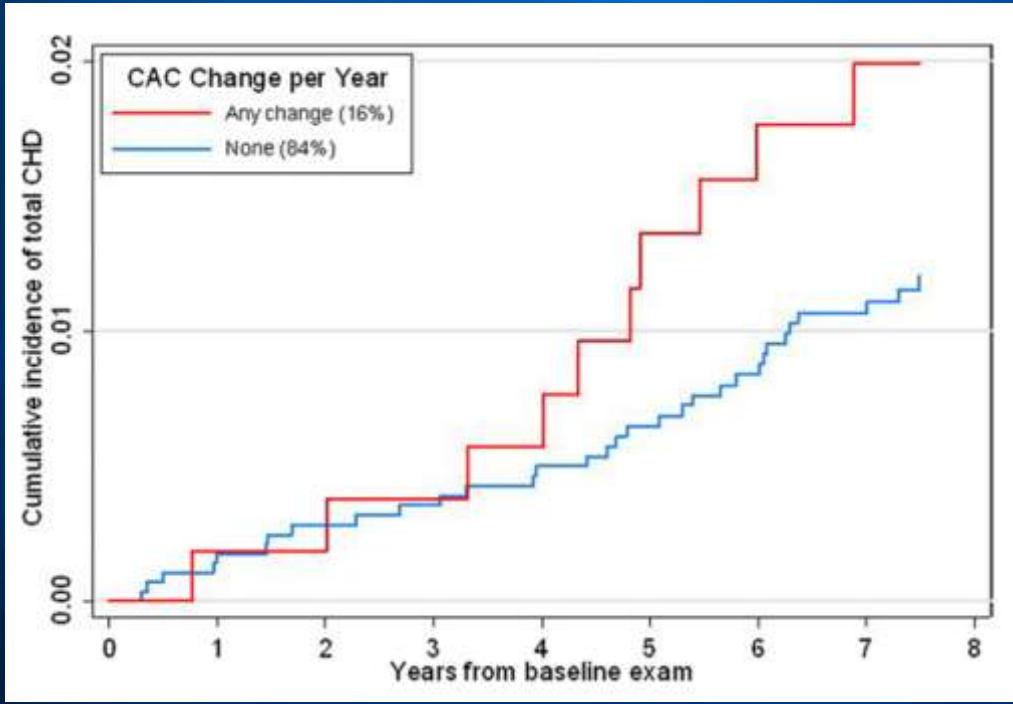
- Total amount of noncalcified plaque (HR 1.18/100mm^3)

Kristensen et al. JACC 2011: 502-9

Plaque Progression by Calcium Score

Prognostic value after Acute Coronary Event

*** Any Change of Calcium Score**

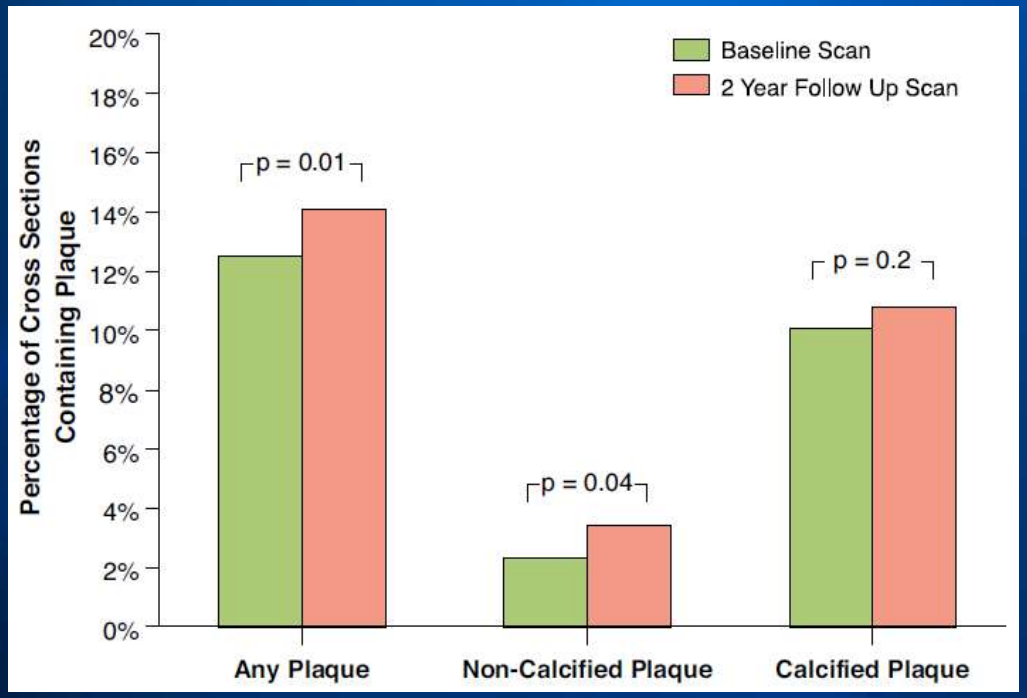


- 6778 MESA population
- The Average annual change
  - 24.9 Agatston units
- Progression of ≥ 300 / year,
  - HR 6.3 for hard CHD

Budoff M et al. 2013:1231-9

Plaque Progression by CCTA
2-year F/U in symptomatic patients

Progression of coronary plaque

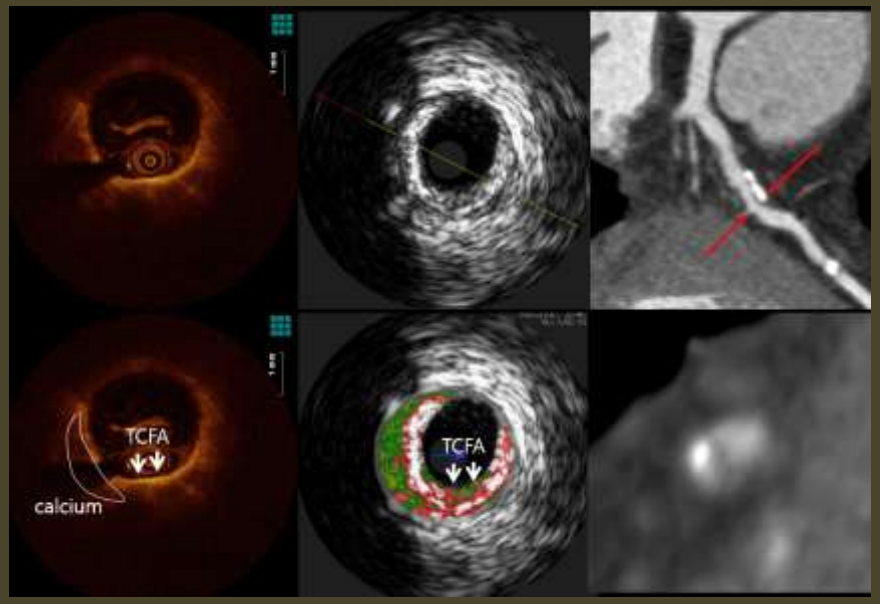


- 69 patients with chest pain
- Initially, no ACS
- 2-year follow-up CCTA
- Coronary plaque burden with acute chest pain significantly increased during 2 years
- Prognostic value / Effect of medical treatment on progression ?? - Unknown

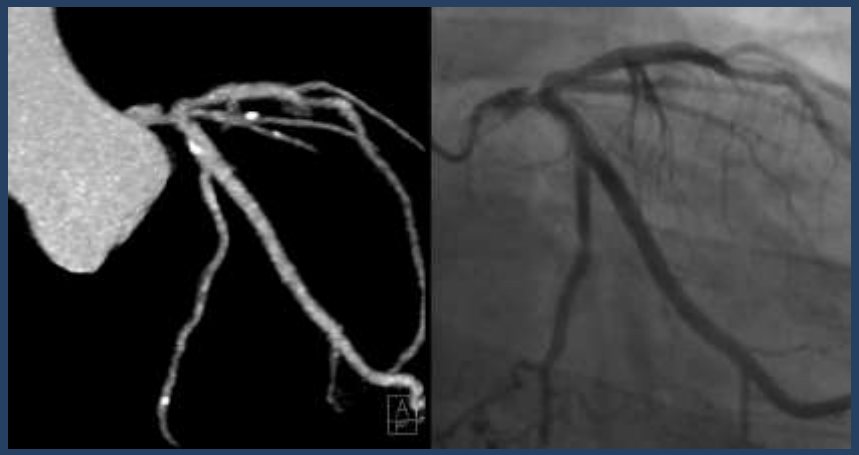
Lehaman et al. JACC img 2009:1262-70

3. Plaque type and Progression by CT - Prognostic value

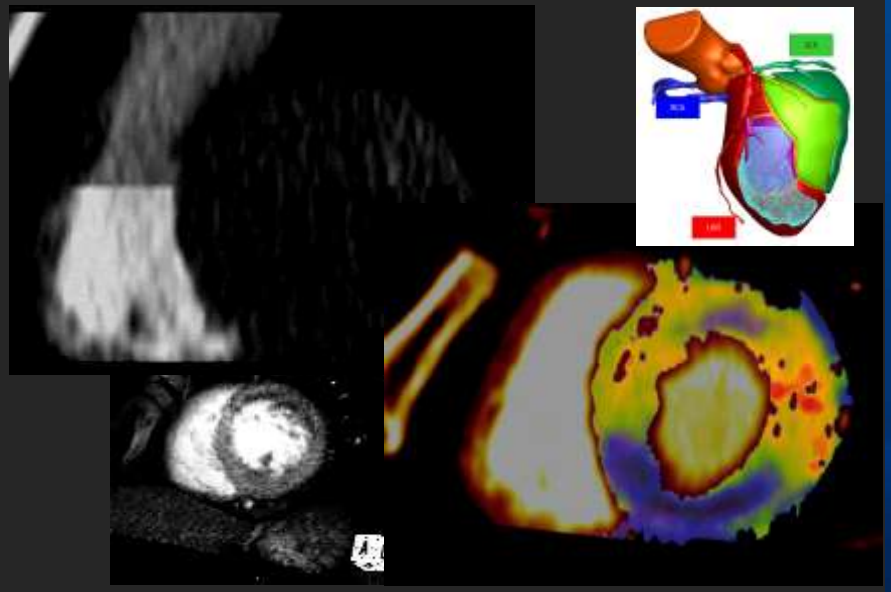
- Plaque type, high-risk morphology of plaque, noncalcified plaque burden assessed by CT provide prognostic implication.
- Plaque progression assessed by calcium score is helpful to stratify patient risk.
  - Prognostic implication of plaque progression by serial CCTA need to be evaluated.



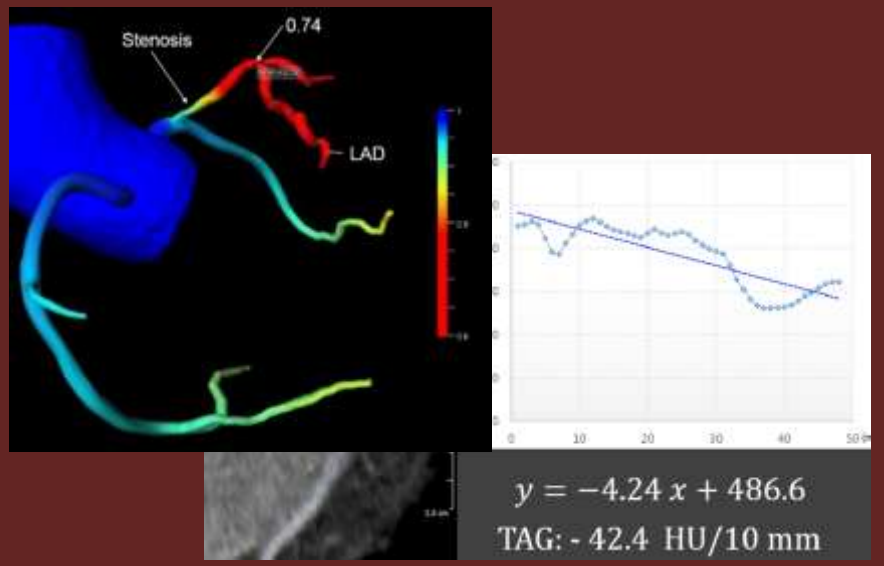
Plaque Imaging



Anatomic assessment



Myocardial perfusion



Functional Image (CT-FFR, TAG)