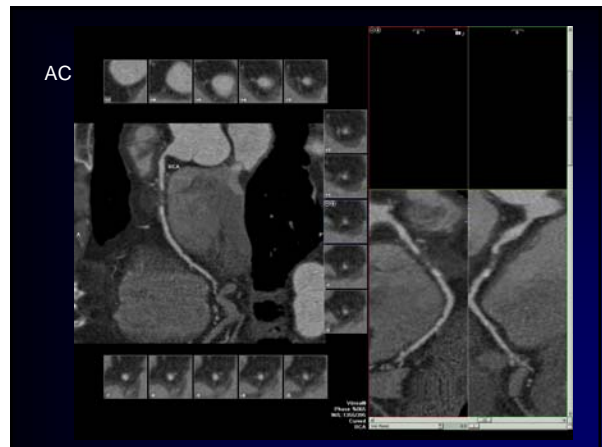
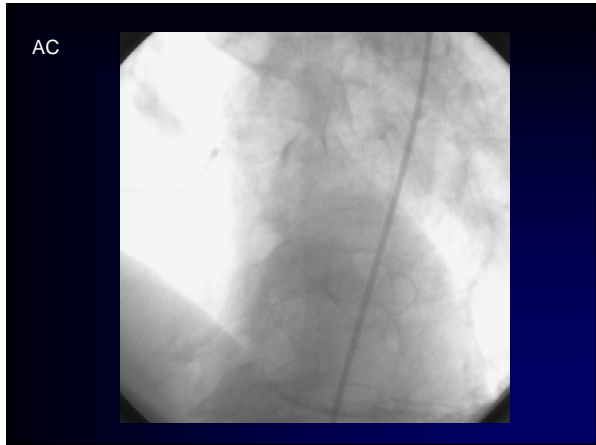
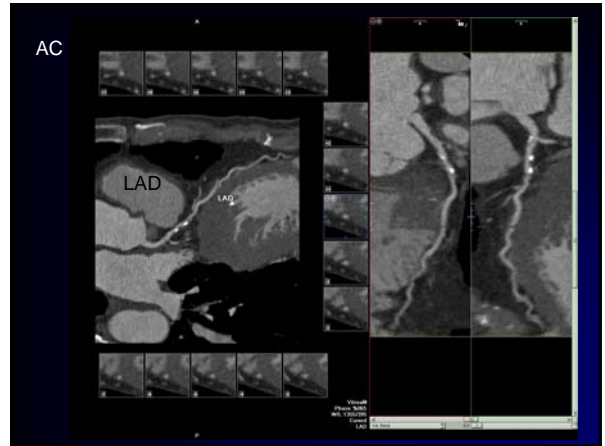
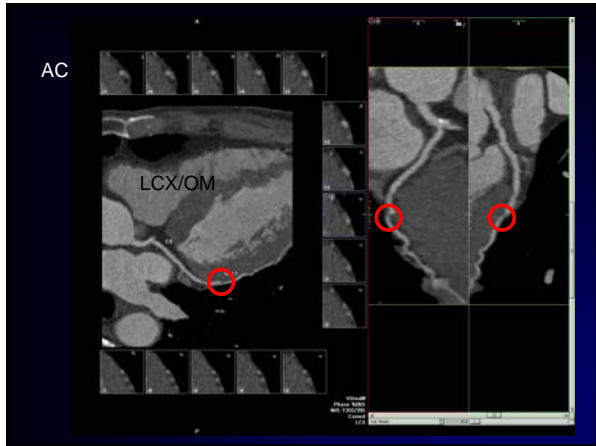
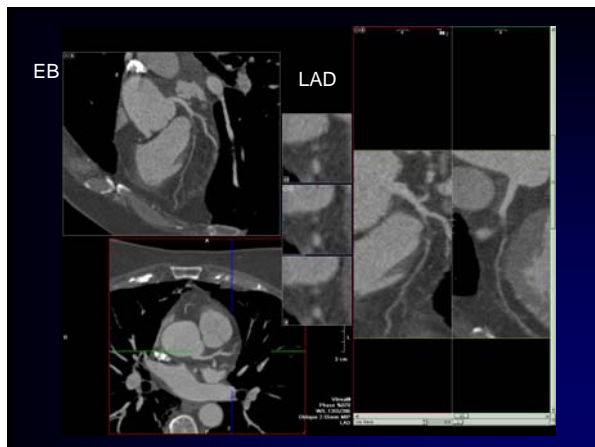
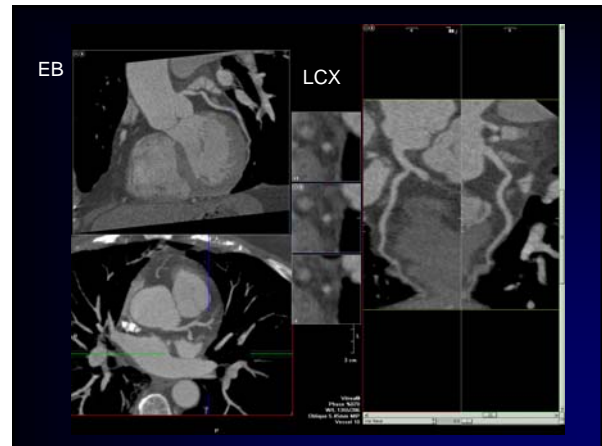
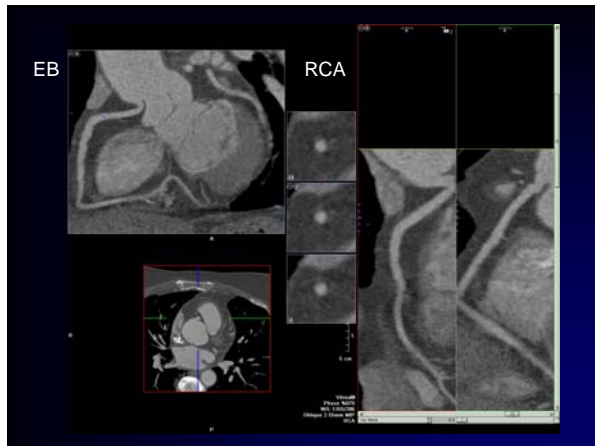


- AC, 64 male with one severe episode of chest pain a year ago
- Palpitations; no recent CP
- HTN; DM-II; remote tobacco use; Positive FH
- ECG: Chronic LBBB
- Vasodilator MPI: EF 53%; fixed anteroseptal and Inferior defects possibly due to LBBB +/- diaphragm; No ischemia





- EB, 57 year old female with fatigue and mild SOB but no chest pain
- HTN, dyslipidemia, FH (mother CABG)
- Severe anxiety disorder
- Ex-MPI: Positive EKG at 8.3 METs; No chest pain; fixed anterior defect – breast attenuation (normal EF and wall motion)



LHC

- 100% mid LAD immediately after take-off of D1 with extensive L > L and R > L collaterals
- Normal LCX and RCA
- Normal LVEF and wall motion

Situations in which CCTA is more accurate

- Reduced sensitivity of exercise stress testing in high level athletes due to inability to reach ischemic threshold
- Reduced accuracy of imaging stress tests in the setting of LBBB
- Possibility of false negative MPI due to balanced ischemia
- Reduced sensitivity with attenuation artifacts on MPI

Advanced Cardiovascular Imaging Consortium
 Collaborative Quality Improvement Initiative
 Sponsored by BCBSM

- CCTA has a very high (>95%) NPV
- Ideal in low-intermediate (10-50%) pre-test probability patients to rule out obstructive CAD, i.e. to avoid a normal invasive cath
- Prior equivocal or discordant stress test 45%
 - 2/3rd nuclear and 1/3rd echo
 - Normal = 41%
 - Non-obstructive = 31%
 - Intermediate severity (51-70%) = 9%
 - Severe (>70%) = 8%
- CCTA should not be an additional layer of test – safety (radiation) and cost

Advanced Cardiovascular Imaging Consortium
 Collaborative Quality Improvement Initiative
 Sponsored by BCBSM

Radiation Dose From Cardiac Computed Tomography Before and After Implementation of Radiation Dose-Reduction Techniques

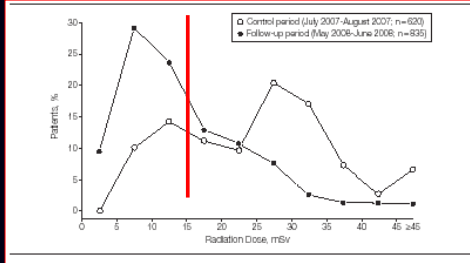
Gilbert L. Raff, MD
 Kavitha M. Chinnaiyan, MD
 David A. Sharr, MD, MPH
 Tamir Y. Goraya, MD, PhD
 Ella A. Kazerooni, MD
 Stuart Marmorek, MD
 Ralph E. Lewis, RT
 Adnan Abulata, MD, PhD
 For the Advanced Cardiovascular Imaging Consortium Co-Investigators

Context: Cardiac computed tomography angiography (CCTA) can accurately diagnose coronary artery disease, but radiation dose from this procedure is of concern.

Objectives: To determine whether a collaborative radiation dose-reduction program would be associated with reduced radiation dose in patients undergoing CCTA in a statewide registry over a 1-year period and to define its effect on image quality.

Design, Setting, and Patients: A prospective, controlled, nonrandomized study conducted during a control period (July-August 2007), an intervention period (September 2007-April 2008), and a follow-up period (May-June 2008) at 15 hospital imaging centers participating in the Advanced Cardiovascular Imaging Consortium in Michigan, which included small community hospitals and large academic medical centers. A total of 4995 sequential patients undergoing CCTA for suspected coronary artery disease were enrolled; 4862 patients (97.3%) had complete radiation data for analysis.

4995 patients in 15 Michigan Centers
 Implementation of best practice model
 Effective dose reduction by 53% (21 mSv to 10 mSv)
 No change in image quality



Raff, JAMA: 2009

Does zero or low calcium score rule out CAD?

- 668 consecutive patients undergoing CCTA and CACS
- Prevalence of obstructive CAD: 7.2% in zero calcium and 17% in low (1-100) calcium groups (similar in those with acute versus chronic symptoms)
- Despite CACS' long term predictive power for CV outcomes, zero or low calcium score cannot be safely used to rule out CAD as the basis of symptoms

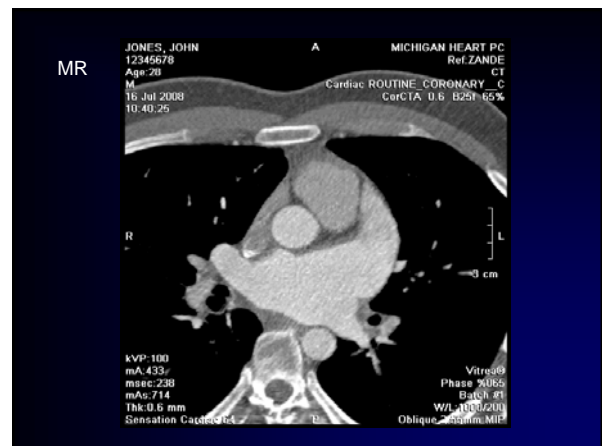
Rubenstein, AJC: 2007; Cheng, AJC: 2007

Accuracy of CCTA in LBBB

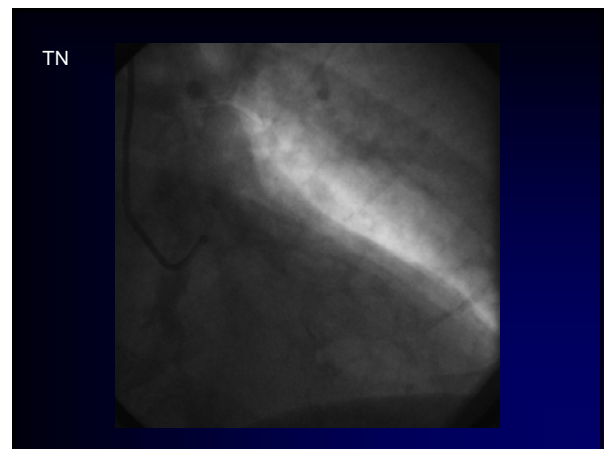
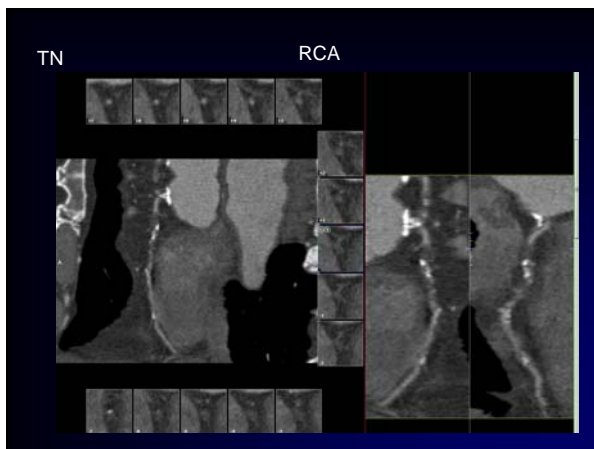
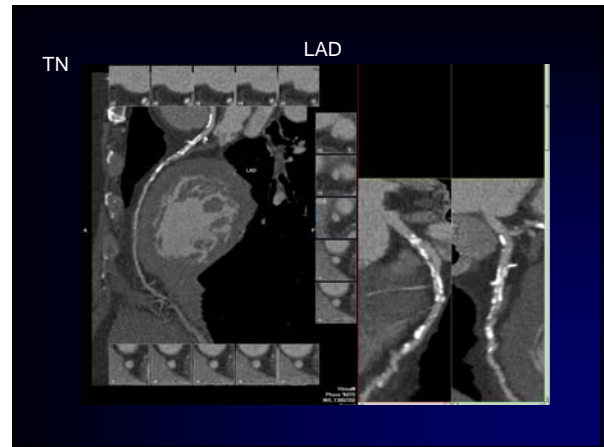
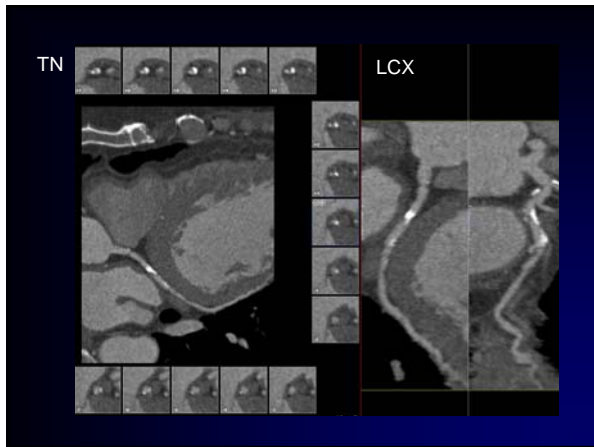
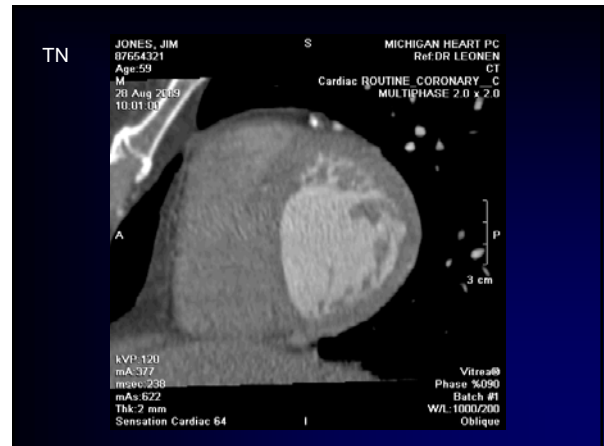
- Prevalence of LBBB increases from 1% at age 50 to 17% by age 80
- Nearly 50% of LBBB is associated with underlying CAD
- MPI often yields false positive results in anteroseptum; Dobutamine echo has reduced sensitivity for LAD ischemia
- In 66 patients with LBBB undergoing CCTA (invasive cath as gold standard) overall accuracy = 95%
 - Sensitivity 97%; Specificity 95%; PPV 93%; NPV 97%

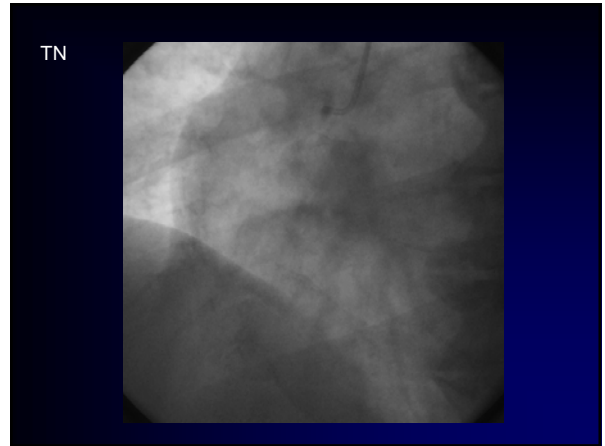
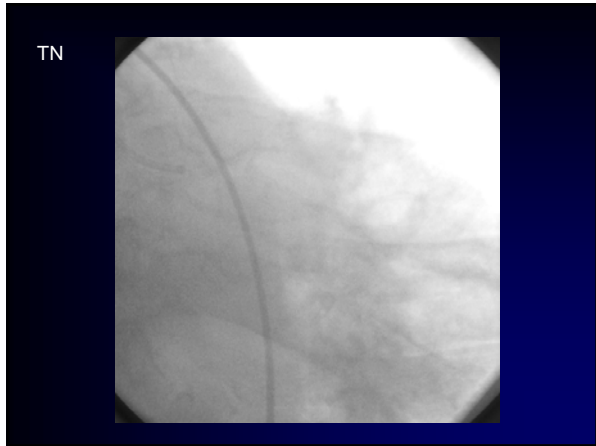
Ghostine, JACC: 2006

- MR, 29 year old male with CHF, dilated CM, EF 15-20% diagnosed 2 years ago
- CVRFs: Tobacco abuse; strong FH of CAD (father CABG 50); mild HTN and severe obesity
- History of pulmonary embolism



- TN, 59 male with dyslipidemia, ongoing tobacco and prior Etoh abuse diagnosed with alcoholic cardiomyopathy 2 years ago
- Now with mild exertional dyspnea and chest tightness
- MPI with fixed inferior defect; EF 25%
- Echo suggests new inferior RWMA

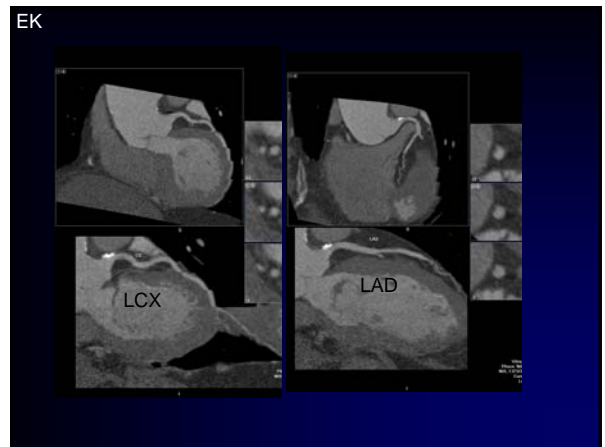
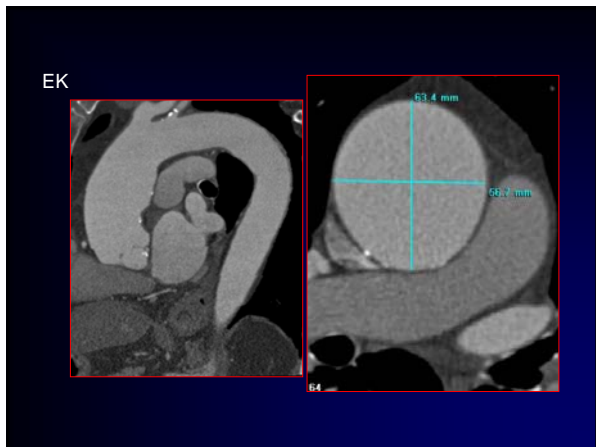




CCTA in severe LV dysfunction

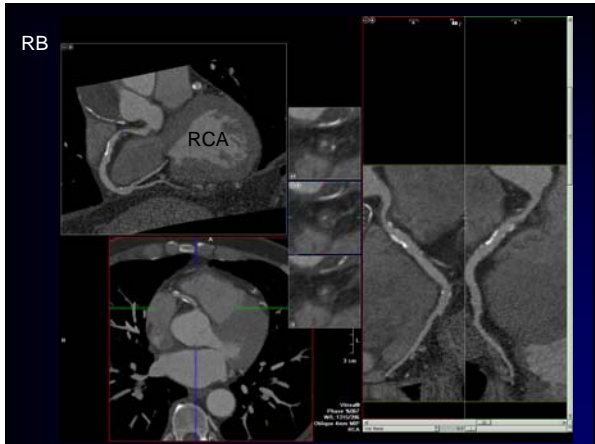
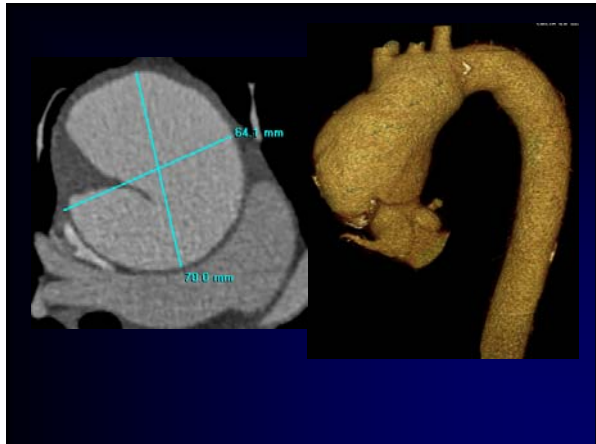
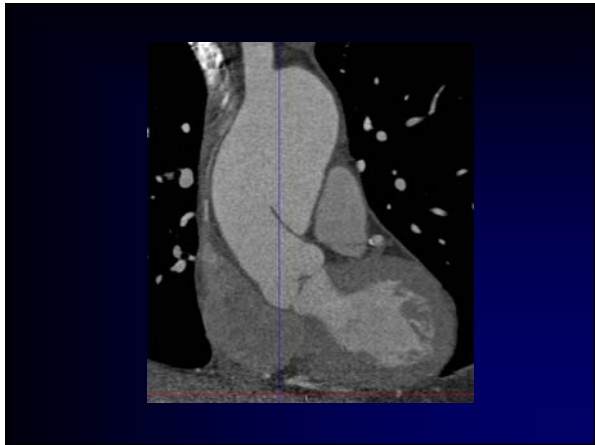
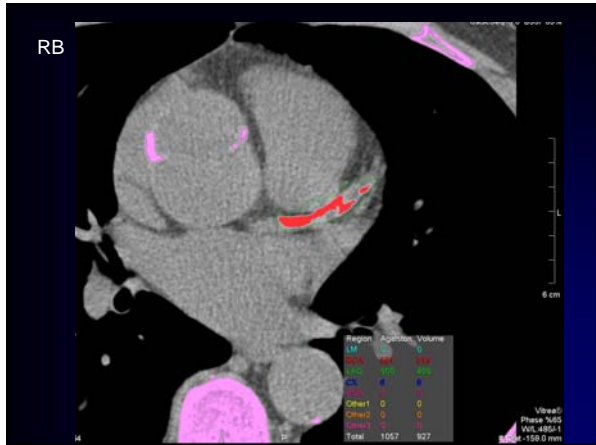
- Reduced accuracy of imaging (nuclear and echo) stress tests
- In a study of 112 explanted hearts, 9 out of 38 (24%) with label of non-ischemic CM had severe CAD. Three of the 4 with presumed alcoholic CM had severe ischemic heart disease
▶ Boltman, AJC, 1994;
- High accuracy of CCTA demonstrated in a cath-correlation study of 61 patients with new diagnosis of DCM
▶ Andreini, JACC, 2007;
- Evaluation with CCTA in new-onset heart failure or LV dysfunction rated as appropriate
▶ Hendel, JACC, 2006;

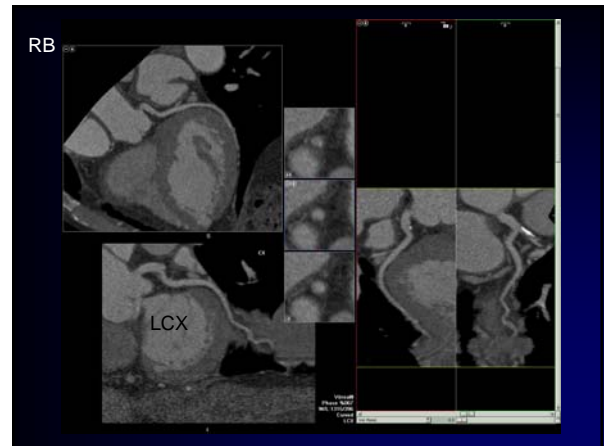
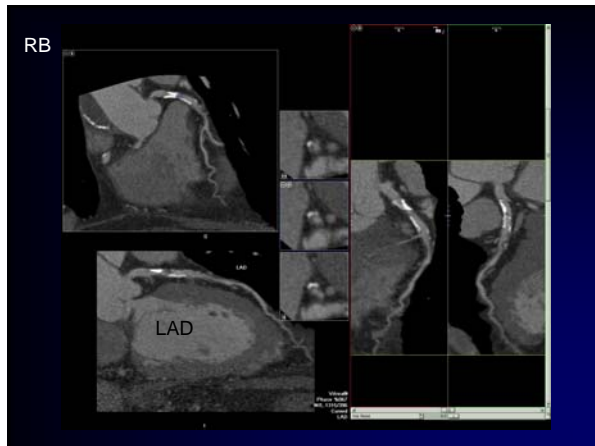
- EK, 67 male with HTN incidentally noted to have dilated aortic root and ascending aorta on echocardiogram ordered by PCP
- CCTA to evaluate both aortic aneurysm and coronary arteries





- RB, 63 year old surgeon arrives for CAC assessment on PCP's suggestion
- Asymptomatic, very active, former Karate player
- HTN, mild dyslipidemia





Pre-operative Use of CCTA

- In situations where invasive coronary angiography may not be feasible for either technical or safety reasons
 - (large ascending aortic aneurysm, Type-A aortic dissection, large aortic valve thrombus, vegetation or tumor close to coronary ostia)
- Pre-operative evaluation in patients undergoing intermediate or high risk non-cardiac surgery and with intermediate pre-operative risk markers – (Uncertain Category)
 - Hendel, JACC: 2006
- In place of invasive coronary angiography prior to cardiac valve surgery in carefully selected (low-intermediate, 10-50% pre-test probability) patients
 - Sensitivity 100%; Specificity 92%; PPV 82%; NPV 100%
 - Meijboom, JACC 2006

Summary

- **False negative stress test**
 - High ischemic threshold
 - LBBB
 - Balanced ischemia
 - Attenuation artifacts on MPI
- **LV systolic dysfunction/CHF**
- **Pre-operative**

