

Coronary CTA for Acute Chest Pain

Pros and Cons



Gilbert L. Raff, MD
Director, Advanced Cardiovascular Imaging
William Beaumont Hospitals
Royal Oak, MI

Disclosure Statement



- Siemens - Research grant.
- Blue Cross/Blue Shield of MI – Research grant.
- There will be no discussion of off-label use of drugs.

Chest Pain: An ER Epidemic

- CP visits are 20% of all ED visits
- 8 Million/Yr in USA alone (2006) *Up from 6 million in 2003
 - 25% AMI/ACS
 - 25% UA/angina
 - 50% Non-cardiac

Increasing due to:

- population increase
- aging
- obesity
- diabetes
- loss of health insurance

McCaig LF, Burt CW. The national hospital ambulatory medical care survey: 2003 emergency department summary. Adv Data 2005;358.

Evaluation Strategies

- "Traditional" RO MI with serial enzymes/EKGs
 - Missed ACS = 2-8% with Mortality rates 10 – 25%
 - 20% ER Malpractice Dollars.
 - Consequence: Zero tolerance for misdiagnosis
- Added testing increases accuracy
 - Reduces pt risk and malpractice risk
 - EKG-only stress
 - MPI: rest-stress, rest-only, stress-only
 - Stress echo
- Time consuming and expensive (est. \$15 Billion/yr)

Coronary CTA – Pros



- Accuracy
- Safety
- Speed
- Cost
- Additional thoracic diagnosis

The ACCURACY Trial - Diagnostic performance of CTA in patients without known CAD

J Am Coll Cardiol 2008;52:1724–32

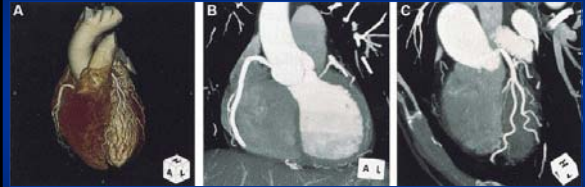
- 16 sites with 230 patients undergoing both CTA and invasive angiography
- Excluded patients with prior CAD
- CAD incidence 24% (more similar to ED group)
- For detection of $\geq 50\%$ stenosis:
 - Sensitivity 95% PPV 64%
 - Specificity 83% NPV 99%
- For detection of $\geq 70\%$ stenosis:
 - Sensitivity 94% PPV 48%
 - Specificity 83% NPV 99%

Prediction of ACS by CTA in ACP – The ROMICATS trial

J Am Coll Cardiol 2009;53:1642-50

- 368 patients with acute CP in ED
 - Negative troponin/CK MB
 - Normal or nondiagnostic EKG
 - Primary outcome ACS by adjudicated clinical panel
- By CTA 50% had no CAD, 31% had nonobstructive disease, and 19% had inconclusive or positive computed tomography for significant stenosis.
- CTA lesion $\geq 50\%$ - accuracy for prediction of ACS:
 - Sensitivity 77% Specificity 87%
 - PPV 35% NPV 98%

CT-STAT: Coronary computed Tomography in the Systematic Triage of Acute chest pain patients to Treatment



CT-STAT Randomized multicenter trial comparing CTA to rest-stress MPI in acute chest pain (Submitted for publication)

- 750 patients at 16 sites
- Patient Selection
 - No prior CAD; low-intermediate TIMI score (-27% pts)
 - No contra contrast/BBs; or >1.5 creat (-15%)
 - Normal enzymes/non-ischemic EKG
- Patients randomized:
 - CTA or MPI for index noninvasive test
 - Primary physicians managed after noninvasive Dx
- Study Outcomes
 - Time to diagnosis
 - ED cost of care
 - MACE events in patients diagnosed as normal by CTA or MPI

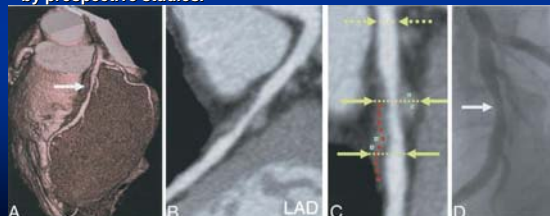
CT-STAT Results - Efficiency, Cost and Safety

	CCTA Group N=361	SOC Group N=340	p Value
Time-to-diagnosis (hours)	2.9 (2.1, 4.0)	6.2 (4.2, 19.0)	<0.0001
Median (25 th , 75 th percentile)			
Total ED costs (dollars)	2137 (1660, 3077)	3458 (2900, 4297)	<0.0001
MACE events In patients considered 'normal'	2/320 (0.6%)	1/304 (0.3%)	1.00

SD = standard deviation, ED = emergency department

CTA offers plaque morphology and "IVUS"-like information about composition

- Bulky, positively remodeled plaque with no stenosis. IVUS showed hypoechoic area.
- This may offer much additional information but requires verification by prospective studies.



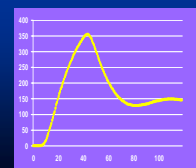
Motoyama, J Am Coll Cardiol 2007;50:319-26

Ancillary Thoracic Dc "Triple Rule Out"

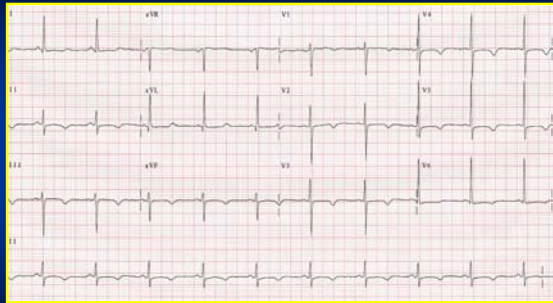
- Technically feasible
- Adjust field of view
- Image caudal to cranial
- Adjust contrast dose
 - 5cc/sec x 1.22 ml/kg
 - Then 20 cc @ 3 cc/sec



Acceptable peripheral pulmonary arterial contrast



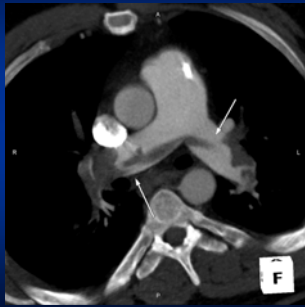
57 yo Male with chest pain: EKG



ASA, Plavix, IV Heparin, Integrilin, Nitro

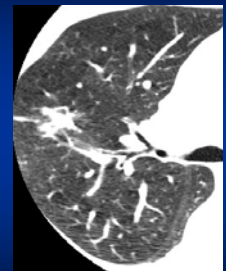


PE – the ‘triple’



Pulmonary parenchyma – the “quintuple” feature

- 62 year old male
- 60 pack-year smoker
- Atypical right sided chest pain



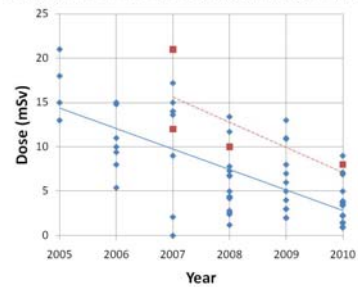
2.5 cm right upper lobe nodule

Coronary CTA – Cons



- Selected pt group: ~60%
 - Prior CAD pts not appropriate – will have multiple lesions
 - Beta Blocker contraindications
 - Renal dysfunction
- Requires radiation
- Requires contrast
- Does not identify ischemia
 - Intermediate grade lesions
 - Not appropriate in high-risk group

Radiation Dose from Coronary CT Angiography



Contrast complications

Beta blocker pretreatment before coronary CT angiography does not increase the rate of contrast reactions. Gilbert L. Raff, MD, Kavitha M. Chinnaiyan MD, Aiden Abidov MD, PhD, Carl Lauter, MD for the Advanced Cardiovascular Imaging Consortium Investigators.

Among patients without presumed contrast allergy, 6780/8705 (78%) received beta blockers, and their incidence of allergic reactions was 15/6780 (0.2%); whereas 1925 did not receive beta blockers and their incidence of allergic reactions was 4/1925 (0.2%) (P =1.00).

A total of 378 patients had history of contrast allergy; 268 patients by their history and additional 110 patients premedicated for presumed allergy; whereas 8705 had no evidence of prior contrast reaction. Overall, 318/378 (84%) received allergy prophylaxis.

Among allergic patients, 327/378 (87%) received beta blockers; their overall rate of allergic complications was 3/327 (0.9%); whereas, 51 received no beta blockers and their rate of allergic reactions was 1/51 (2.0%) (P =0.44).

Conclusions

Among patients with or without history of contrast allergy the rate of contrast reaction was low, and there was no difference in the rate of allergic complications if beta blockers were administered prior to coronary CT angiography.

Summary

- CTA is not ideal for patients with:
 - Prior known CAD
 - High-risk for ACS
 - Women < 40 yrs
 - Beta blocker intolerance, renal dysfunction, anaphylaxis
- However, for appropriately chosen acute CP pts CTA offers significant advantages:
 - Safety and accuracy
 - Reduced diagnostic time
 - Lower cost
 - Additional thoracic diagnosis

Thank you for your attention!

