Chest Pain in the ED: Is 24-hour coverage necessary?

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Educational Objectives

• Understand the utility of performing coronary CTA (CCTA) in the emergency department (ED)
• Review the numerous steps in performing CCTA
• Discuss the various methods of providing (or not providing) coverage for this test
Clinical Studies

- ROMICAT II (Hoffmann et al)
  - Decreased hospital stay
  - Increased downstream radiation exposure and testing
  - No cost difference
  - Patients scanned “during day hours”

- CT-STAT (Goldstein et al)
  - Reduced time to diagnosis
  - Decreased cost with CCTA
  - Patients scanned “when research coordinators present”

- CT Angiography for Safe Discharge of Patients with Possible Acute Coronary Syndrome (Litt et al)
  - Reduced time to diagnosis
  - No MACE 30 days post normal CCTA
24-hour coverage debate

• Not a new controversy in radiology
• Was a concern when CT pulmonary angiography (CTPA) was first developed
  – Residents quickly developed necessary skills to read CTPA scans to provide 24-hour coverage
• Models with more advanced imaging do exist
  – Acute stroke cases
  – Currently covered by neurointerventionalists, neuroradiologists, ± neurosurgeons in many institutions 24 hours
Is 24-hour coverage necessary?

• For technology to be accepted as gold standard in acute setting, needs to be available 24 hours a day, seven days a week, 365 days a year

• Examples
  – CT Pulmonary Angiography
  – CT Angiography of the Aorta
  – CT of the abdomen for appendicitis/diverticulitis
  – Cardiac catheterization
  – Imaging/intervention of acute stroke
  – Interventional radiology
  – Endoscopy
The Big Question

Is 24-hour coverage necessary?

- Yes
  - Let’s discuss the options
- No
  - Enjoy an early lunch
The Big Question

Is 24-hour coverage necessary?

- Yes
  - Private Institution
  - Academic Institution
- No
  - Enjoy an early lunch
The Big Question

Is 24-hour coverage necessary?

Yes

Private Institution

Attending Coverage

Teleradiology

Academic Institution

Resident Coverage
Resident Coverage

**Pros**

- Residents routinely on call after hours at nearly all academic institutions
- Residents tend to be more receptive to newer technologies
- I get a good night’s sleep

**Cons**

- Many institutions do not teach residents how to acquire or read images
- Younger residents take call
  - May change
- Residents extremely busy
  - Need to talk to patients and give medications
  - Complex CCTA studies can take up to an hour to read let alone time necessary to acquire study
- Will ED physicians act on resident prelim?
Differences in CTPA and Coronary CTA

• Coronary CTA has unique challenges
  – Image acquisition
  – Patient preparation
  – Image reconstruction
  – Image interpretation
Image Acquisition

• CCTA can have extraordinarily high radiation doses if patient not properly scanned
• Images can be nondiagnostic or have limited diagnostic ability if proper protocol not selected
• No set scan protocol in CCTA
  – Best scan protocol based on numerous patient factors
    • Pretest probability
    • Age
    • Weight (distribution)
    • Heart Rate
    • Ability to comply with instructions
    • Co-morbidities
  – Numerous parameters you can adjust and tweak
  – Takes years of experience
• Need good technologists
Image Acquisition

• Pros and Cons for each method
  – FLASH (range 0.5-1.5mSv)
    • Low dose
    • No functional information
    • Lower HRs necessary
    • Limited in obese patients
  – Prospective (1mSv-5mSv)
    • Low dose
    • No functional information
    • Limited in obese patients
    • Best with lower HRs
    • Phase tolerance available (usually up to 10%, increases dose)
  – Retrospective (3mSv-30mSv)
    • High dose
    • Functional information
    • Tube current modulation available
    • Phase tolerance available
    • Can be used in obese patients
    • Can be used in patients with irregular rhythms
Patient Preparation

• Talking with patients
  – Discussing scan and importance of breath-holding

• Medication
  – Knowledge of doses and contraindications imperative
  – IV metoprolol (5-20mg)
    • Hypotension
    • Bradycardia
    • Asthma
    • Severe AS
  – Sublingual nitroglycerine (0.4-0.8mcg SL)
    • Hypotension
    • Recent sidenafil (or other similar medication) usage (72hrs)
Image Reconstruction

• FLASH and prospective (w/o phase tolerance)
  – No major decisions to be made
    • Reconstruction algorithm and iterative reconstruction
  – What you get is what you get

• Prospective (with phase tolerance)
  – Various phases available (usually up to 10)

• Retrospective
  – Up to 100 phases available for reconstruction
  – Usually at 10% intervals + 75% (78%)
  – EKG editing
Image Interpretation

• Interpretation of CCTA studies can take many years to master
  – Basics can be learned in a few weeks
• Need to learn numerous new things
  – Pathology
  – Anatomic variants
  – Image manipulation (3-D software)
  – Proper nomenclature
  • How to speak in cardiology terms
Resident Coverage

Can work if

1. Residents are trained appropriately
2. Technologists are good
3. Nursing staff coverage available
4. ED willing to accept and act upon resident preliminary report
5. Attending available remotely if necessary
The Big Question

Is 24-hour coverage necessary?

Yes

- Private Institution
  - Attending Coverage
  - Teleradiology

- Academic Institution
  - Resident Coverage
24-hour coverage

Academic or Private Hospital

Attending Coverage

Cardiothoracic Radiologist + Cardiologist

ED Radiologist
ED Radiology Attending Coverage

**PRO**
- Available on-site after hours
- Can provide final read which is acted upon by ED
- Can provide guidance to technologists
- Can administer medications

**CON**
- Not familiar with CCTA
  - Would need to be trained similar to residents
  - Uncomfortable with final read
- Reluctance (or downright refusal) to increase workload
24-hour coverage

Academic or Private Hospital

Attending Coverage

Cardiothoracic Radiologist + Cardiologist

Cardiothoracic Radiologist

ED Radiologist
Cardiothoracic Radiology Attending

**PRO**
- Best for patient care
- Best for radiology as a whole
- ED provided subspecialty coverage 24/7 with final reads
  - Will act on results
- Exams can be protocolled appropriately
- Can often be done remotely

**CON**
- Need someone onsite to give meds, talk to patient
- Remote workstations
  - Expensive
  - Can be very slow
- Not all thoracic radiologists read CCTA
  - Our section is 3/6
  - No desire to be q3
Cardiothoracic Radiology Coverage
Possible Options

• Make CCTA mandatory (q6)
  – At our institution would never happen
• Fellows (q5 or q8)
  – Need a few months to get up to speed
• Increase # of thoracic radiologists on staff
  – Large expenditure for department
• Increase compensation
  – Departments likely hesitant given money crunch
• Share workload over multiple regional hospitals
  – Need software and hardware
  – Need privileges and potentially state licenses
24-hour coverage

Academic or Private Hospital

Attending Coverage

Cardiothoracic Radiologist + Cardiologist

ED Radiologist
Cardiothoracic Radiology and Cardiology Attending Coverage

**PRO**
- Final reads provided which ED will act upon
- Number of faculty will make coverage reasonable
- Cardiologists very knowledgeable

**CON**
- Not best for radiology
  - Turf issues
- Teach cardiologists how to acquire and read studies
  - Turf issues
- Someone needs to be onsite for medication administration
  - Now have cardiology residents and fellows
- More remote workstations necessary
  - Increased expense
24-hour coverage

Academic or Private Hospital

Teleradiology
Teleradiology

PRO

• According to websites
  – Do read coronary CTA
  – Provide 24-hour service
  – Fellowship trained
  – ACC/ACR certified
  – Will provide final reads
  – Will do 3-D post-processing

• I get to sleep
Teleradiology

**CON**

- Too many to list
- Who is reading your study?
- Bad for radiology
  - Commoditization of industry
- Bad for department
  - Paying someone else to read studies
- Bad for thoracic radiologists
  - Could make a portion of our job irrelevant
- Still need someone onsite to protocol study and give meds
The Big Question

Is 24-hour coverage necessary?

Yes

No
24-hour coverage is **NOT** necessary

**PRO**
- Do not have to worry about implementation
- Can sleep at night

**CON**
- CCTA will never really catch on in the emergency setting for low and intermediate risk patients
- Ability to improve radiology revenues
- If we don’t do it, someone else may
  - If they do it at night, then why not during the day
CCTA: Is 24-hour coverage necessary?

- In my opinion, yes
- Implementation will be difficult
- Each option has numerous pros and cons
  - Resident
  - Attending
    - ED
    - Cardiothoracic
    - Cardiothoracic + Cardiology
  - Teleradiology
- Will need to work with our ED staff in deciding best option