Coronary CTA Technique: A How To.
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Disclosures
- Research Support: GE (Amersham), Toshiba, Bracco
- Speaker: Toshiba, Schering (Berlex)

Objectives
- Preparation
- CT Coronary Protocol
- Reconstruction and Reporting
- Indications
- Accuracy of CT and MRI
- Future Applications
- Summary

CT Coronary Angiography
- “Pretty pictures, but not much more useful than a third wheel on your bicycle.”

Cathy DeAngelis, Editor
JAMA Audit Commentary, July 26, 2006

Preparation
- Preparation is everything
- Sinus rhythm
- Course and duration
- Radiation and contrast agent
- 10 s breath hold (submaximum inspiration)
Effective Dose

Contrast Agent

10 s?

Which scanner to purchase?

Preparation

- Nitroglycerin contraindications:
  - Inhibitors of phosphodiesterase
  - Severe aortic stenosis
  - Hypertrophic obstructive cardiomyopathy
  - Hypotension (<100 mm Hg)
  - Intolerance

Preparation

- Beta blocker contraindications:
  - Severe asthma
  - Severe obstructive lung disease
  - Bradycardia
  - Intolerance
CT Coronary Protocol

CT Protocol
- 64 by 0.5 mm
- Sinus rhythm
- Good ECG?

CT Protocol
- 80 cc, right brachial, 4.0-5.0 flow
- Saline chaser*
- 1.3-1.7 g iodine per s
- Calculation of volume:
  \[ \text{Scan length (s)} + 10 \] \times \text{Flow} 

*Caderniti et al. Radiol Med (Torino) 2004

CT Protocol
- No caffeine
- No beta blockers up to 70 bpm
- Beta blocker suggestions:
  - Esmolol (Brevibloc), IV 20-30 mg/min
  - Atenolol, oral, 50 mg

CT Protocol
- Beta blocker complications:
  - Hypotension
  - Bradycardia
  - Asthma
- Slow injection
- Have atropine on board

CT Protocol
- Always use nitroglycerin:

Dewey et al. RoFo 2006
CT Protocol

- Nitroglycerin suggestions:
  - 0.8-1.2 mg glycerol trinitrate
  - 5 mg isosorbide dinitrate

- Nitroglycerin complications:
  - Hypotension
  - Tachycardia

Reconstruction and Reporting

Reconstruction

- 0.5 mm slices
- 10 phases at 10% intervals
- Small FOV (max: 220 mm)
- ECG editing
- Lung/Mediastinal large windows
- Technology

Technology

- Halfscan reconstruction
- Dual-source CT
- Multisegment reconstruction
- Lower HR better images

Halfscan

- Relative Temporal Resolution
  - % of the RR interval vs. Heart rate (bpm)
  - Halfscan
Dual-Source

Relative Temporal Resolution

Heart rate (bpm)

% of the RR Interval

40 50 60 70 80 90 100 110 120 130 140

Multisegment

Relative Temporal Resolution

Heart rate (bpm)

% of the RR Interval

40 50 60 70 80 90 100 110 120 130 140

Reporting

- Axial and curved multiplanar
- 3D and angio emulation for display
- 15 segments
- Quantification of Stenoses

Curved MPRs
Recap of the Protocol

- 64 by 0.5 mm
- Sinus rhythm
- No beta blockers up to 70 bpm
- Nitro
- 80 cc, 4.0-5.0 flow
- 10 s breath hold
- Curved MPRs

Indications

- Low to intermediate likelihood
  - Equivocal stress test
  - Atypical symptoms
- After CABG
- (Cardiac function, thrombus)
- (Suspected anomalies)
- (Acute coronary syndrome)
- No indication: stents, viability
<table>
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<tr>
<th>Bypasses</th>
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| - Accuracy of about 90%  
- Excellent depiction of distal anastomoses | Martuscelli et al. Circulation 2005  

<table>
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<th>Stents</th>
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| - Accuracy of about 70-80%  
- Only BIG stents (≥ 3.5 mm)  
- Less than 50% of the small guys | Schuijf et al. Am J Cardiol 2004 |

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<th>Plaques</th>
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<td>Davies et al. Heart 2000</td>
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Plaques

- Sensitivity: 85-91%*
- Specificity: 92-97%*
- Prognostic implications unknown


Cardiac Function

MSCT vs. MRI

Dewey et al. J Am Coll Cardiol 2006
Some things to keep in mind …

- Pretest likelihood determines utility
- CT better than MRI
- CT good for 20-60% likelihood

Future Applications

- SPECT/CT and PET/CT*
- 4D-CT**

**Kondo et al. JCAT 2005
Patient preference

Summary

- Rule out CAD
- MSCT > MRI
- Sinus rhythm
- No betablockers up to 70 bpm
- Dual-source or Multisegment
- Patients prefer CT