„Coronary CTA : A How To“

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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

Outline

- Preparation
- Indications
- CT Coronary Protocol
- Reconstruction and Reporting
- Cost-effectiveness
- Accuracy of CT and MRI

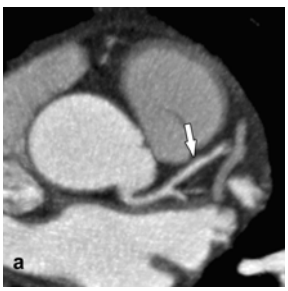
Preparation

Preparation

- Preparation is the key
- Sinus rhythm
- Course and duration
- Radiation and contrast agent
- 10 s breath hold (submaximum inspiration)

Nitrogylcerine

- Always use it:



Dewey et al. RöFo 2006 (Georg Thieme Verlag)

Nitrogylcerine

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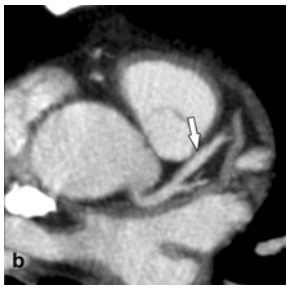

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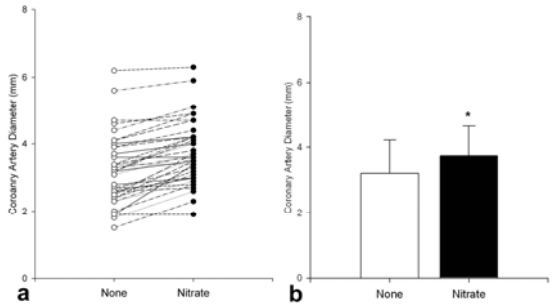
Nitrogylcerine



Dewey et al. RöFo 2006 (Georg Thieme Verlag)

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

Indications

Indications

- Low to intermediate likelihood
  - » Equivocal stress test
  - » Atypical symptoms
- After bypasses

Possible Indications

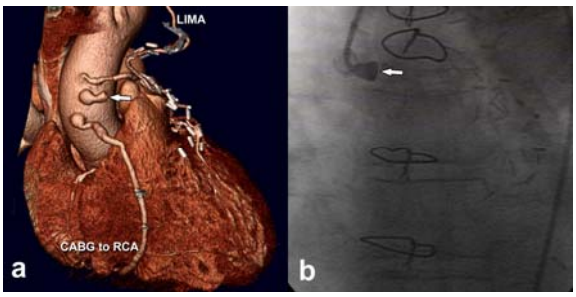
- Cardiac function, thrombus
- Suspected anomalies
- Acute coronary syndrome

No Indications

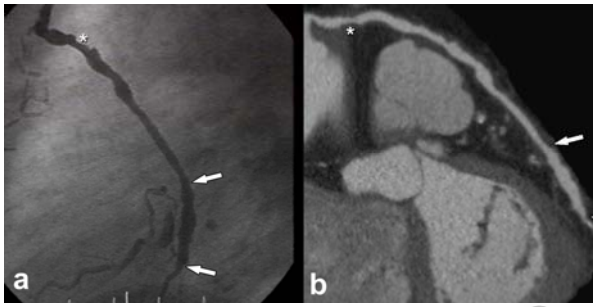
- Coronary stents and plaques
- Myocardial viability

Bypasses

Bypasses



Bypasses



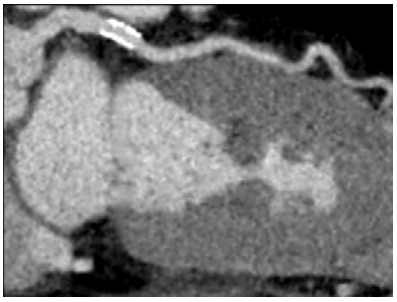
Bypasses

- Accuracy of about 90%
- Excellent depiction of distal anastomoses

Martuscelli et al. Circulation 2005, Yamamoto et al. Ann Thor Surg 2006, Malagutti et al. Eur Heart J 2006, Pache et al. Eur Heart J 2006, Dewey et al. Ann Thor Surg 2004

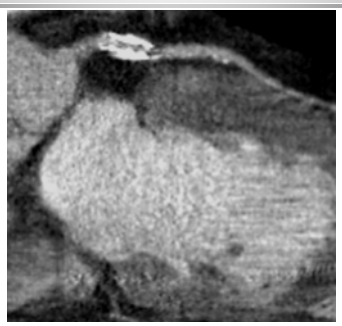
Stents

Stents



Successful (LAD; 3.5 mm)

Stents



Limited (LAD; 4.0 mm)

Stents

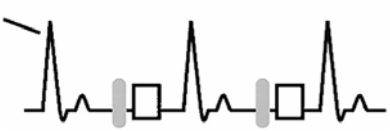
- Accuracy of about 70-80%[1]
- Only **BIG** stents (≥ 3.5 mm)
- Only 50% of the small guys[2]

[1]Schujf et al. Am J Cardiol 2004 [2]Gilard et al. Heart 2006 and Rixe et al. Eur Heart J 2006

CT Coronary Protocol

CT Protocol

- 64 by 0.5 mm collimation
- 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:

[Scan length (s) + 10] X Flow

[10 s + 10] X 4 = 80 cc

*Cademartiri 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

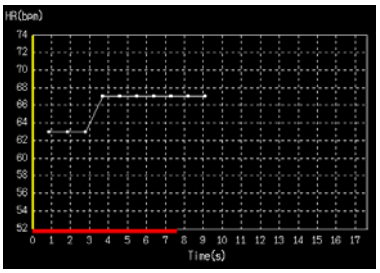
- Beta blocker complications:
  - » Hypotension
  - » Bradycardia
  - » Asthma
- Slow injection
- Have atropine on board

CT Protocol

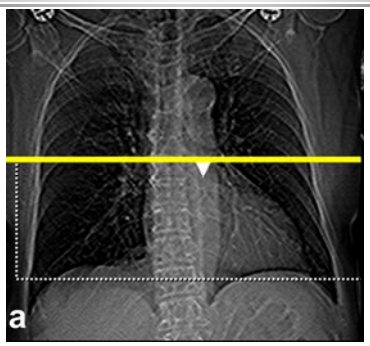
- Nitroglycerin suggestions:
  - » 0.8-1.2 mg glycerol trinitrate
  - » 5 mg isosorbide dinitrate
- Nitroglycerin complications:
  - » Hypotension
  - » Tachycardia

CT Protocol

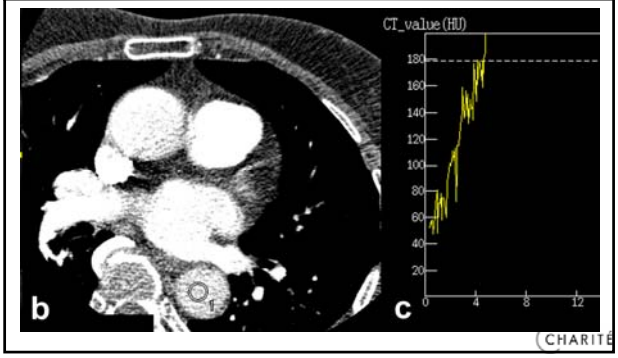
- Breath hold trial:



CT Protocol

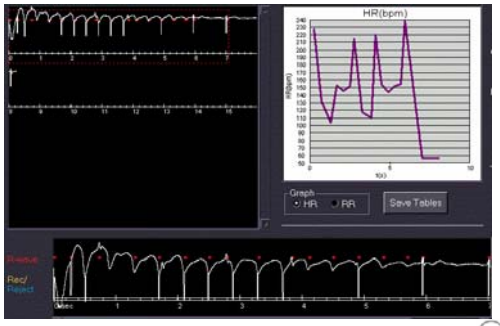


CT Protocol



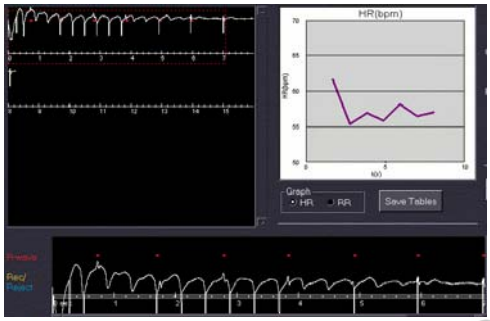
Reconstruction

ECG Editing

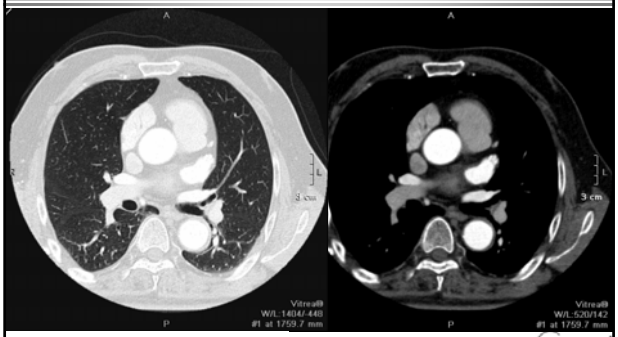


Cademartiri et al. AJR 2006

ECG Editing



Lung Recons



Onuma JACC 2006, Haller AJR 2006, Dewey Eur Radiol 2007

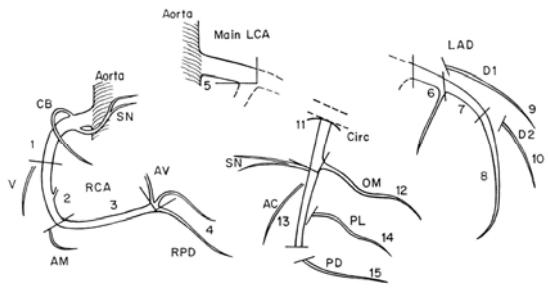
Temporal Resolution

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

Reporting

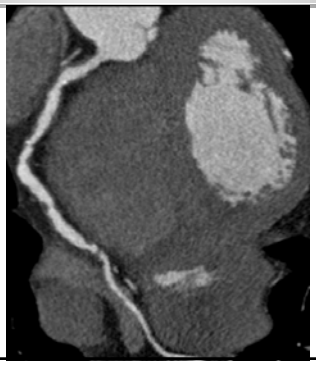
Curved MPRs

Coronary Segments

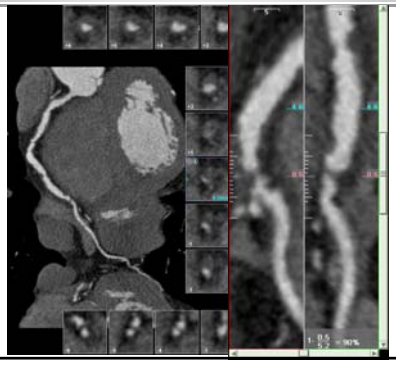


Austen et al. Circulation 1975

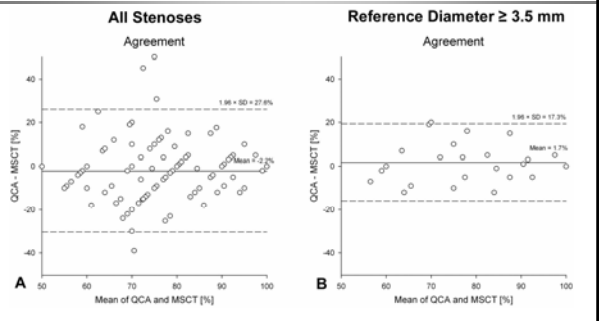
Curved MPRs



Curved MPRs

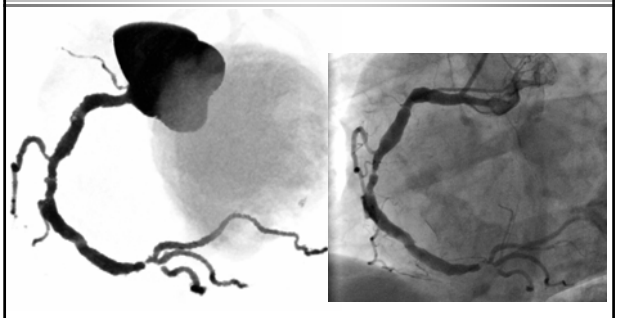


Quantification of Stenoses



Dewey et al. Invest Radiol 2007

Angiographic Emulation



Schnapauff et al. Eur Radiol 2007

Recap of the Protocol

Recap

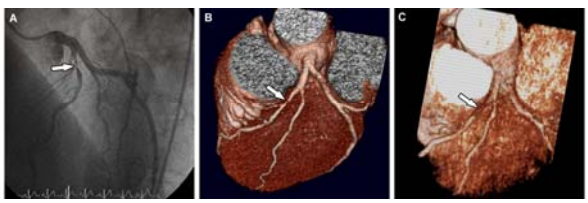
- 64 by 0.5 mm
- Sinus rhythm
- No beta blockers up to 70 bpm
- Nitro
- 80 cc, 4.0-5.0 flow
- 10 s breath hold
- Curved MPRs

Accuracy for CAD

MSCT or MRI?

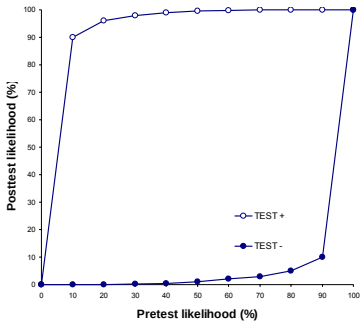
	MSCT	MRI
Sensitivity	97%	73%
Specificity	75%	48%
Patients	1383	616
No. of studies	18	10

MSCT or MRI?

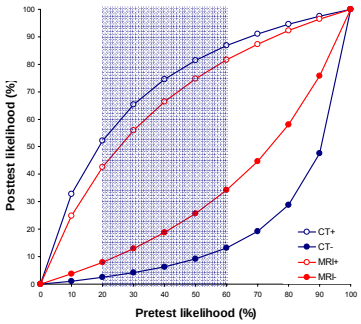


Dewey et al. Ann Intern Med 2006

MSCT or MRI?



MSCT or MRI?



Dewey et al. Ann Intern Med 2006

Some things to keep in mind …

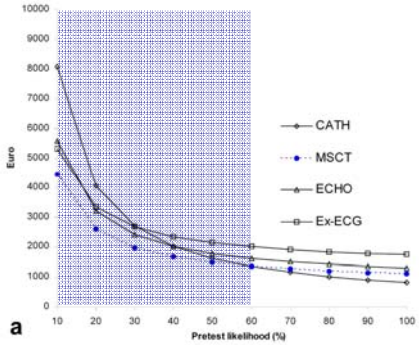
Keep in mind …

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

Cost-effectiveness

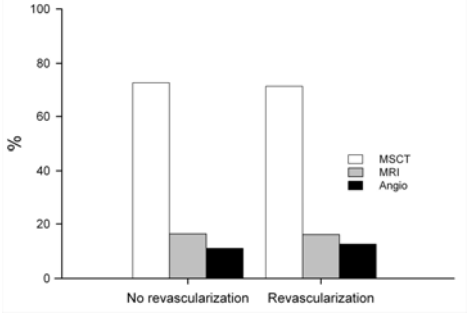
Dewey et al. Eur Radiol 2006

Cost-Effectiveness



Patient preference

Patient Preference



Schönenberger et al. PLoS ONE 2007

Summary

Summary

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