Computed Tomography Can Replace Diagnostic Invasive Coronary Angiography: Pro

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Disclosures

Research Support: Siemens, Bayer Healthcare
Consultant: Guerbet, Servier, Circle
"Coronary CTA can replace coronary angiography."
Purely Diagnostic
CT has limitations.

Motion

Very severe calcium

Noise/body weight
CT requirements:

- Sinus rhythm
- Heart rate
- Breathhold
- Not severely overweight
"Coronary CTA can replace coronary angiography."

August 26, 2012:

"Coronary CTA can replace a substantial number of diagnostic coronary angiograms."
For a diagnostic test to be useful:

- Accurate (not miss a patient with disease)
- Prognostic value (negative test: good prognosis)
- Safe
- Economically reasonable
Accuracy: High negative predictive value.

### META-ANALYSES

<table>
<thead>
<tr>
<th></th>
<th>Sens.</th>
<th>Spec.</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gopalakrishnan</strong></td>
<td></td>
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<tr>
<td>Cardiol in Rev 2008</td>
<td>91%</td>
<td>96%</td>
<td>98%</td>
</tr>
<tr>
<td>PER SEGMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER PATIENT</td>
<td>96%</td>
<td>90%</td>
<td>96%</td>
</tr>
<tr>
<td><strong>Mowatt</strong></td>
<td></td>
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<td>Heart 2008</td>
<td>90%</td>
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<td>PER SEGMENT</td>
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<tr>
<td>PER PATIENT</td>
<td>99%</td>
<td>89%</td>
<td>100%</td>
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**64 Slice CT Meta Analyses**
Accuracy: High negative predictive value.

Alternative to invasive angiography when the aim is ruling out stenoses.
Prognostic Value
CT Angiography for Safe Discharge of Patients with Possible Acute Coronary Syndromes

Harold I. Litt, M.D., Ph.D., Constantine Gatsonis, Ph.D., Brad Snyder, M.S., Harjit Singh, M.D., Chadwick D. Miller, M.D., Daniel W. Enríquez, M.D., James M. Leaming, M.D., Laurence J. Gavin, M.D., Charissa B. Pacella, M.D., and Judd E. Hollander, M.D.

- 1370 subjects with low risk acute chest pain in the ER
- 2:1 randomization to CT vs. standard of care
- 640 patients with negative CT
- 0% 30-day risk of death/MI
Prognosis

Event rate „close to zero“ after ruling out coronary stenoses by CT in symptomatic individuals

Stable Chest Pain

Hadamitzki et al, iJACC 2009
Lesser et al, Cath Card Interv 2007
Danciu et al, Am J Cardiol 2007
Schussler et al, Am J Cardiol 2009
Ostrom et al, JACC 2008
Abidov et al, J Nucl Cardiol 2009
Chow et al, JACC 2010

Acute Chest Pain

Rubinshtein et al, AJC 2007
Goldstein et al, JACC 2011
Hoffmenn et al, NEJM 2012
Litt et al, NEJM 2012
Economically Reasonable
Economically Reasonable
Safe.

German Cardiac CT Registry

3504 coronary CTA examinations

<table>
<thead>
<tr>
<th>Complications</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extravasation</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Allergic to contrast agent</td>
<td>0.3 %</td>
</tr>
<tr>
<td>Symptomatic bradycardia</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Symptomatic hypotension</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Other</td>
<td>0.2 %</td>
</tr>
</tbody>
</table>

No inpatient treatment required.
And it works.

Female, 56 years, chest pain
And it works.

Female, 56 years, chest pain
And it works.

CONFIRM Registry
15,223 patients, suspected CAD
Death, infarct, late revascularization.

Radiation!
Radiation!

German Cardiac CT Registry (n = 4000)

Mean dose: 5.3 mSv
Radiation!

- ECG Pulsing
- Prospective Trigger
- 120 kV => 100 kV / 80 kV
- Iterative Reconstruction

0.8 mSv
Radiation!

0.07 mSv
Unevaluable!
Unevaluable!

MEDIC Trial
N = 415
6 international sites

18 out of 5777 segments unevaluable

6 out of 415 patients: 1 or more unevaluable segment (1.4%)

Achenbach et al, this conference
Unevaluable!

MEDIC Trial

N = 415

6 international sites

18 out of 5777 segments unevaluable

6 out of 415 patients: 1 or more unevaluable segment (1.4%)

Sensitivity 95%

Specificity 95%

Achenbach et al, this conference
Screening!
Correct.

Coronary CT angiography should not be used for screening.
Ruling out Coronary Artery Stenoses

n = 15 223
Can CT Replace Invasive Angiography?

Coronary CT angiography can be a reasonable alternative to invasive angiography.

... to rule out coronary artery stenoses
... if performed with expertise and adequate equipment
... in somewhat selected patients
“Pull out, Betty! Pull out! ... You've hit an artery!”