IMAGING

B. A. Popescu (Bucharest, RO)
Contents

- Coronary artery disease
  - SCOT-HEART
  - CRISP CT
  - SPINS CMR Registry
- Heart failure
  - PROMIS-HFpEF
- Left atrium size and mortality
SCOT-HEART TRIAL
Coronary Computed Tomography Angiography and the Future Risk of Myocardial Infarction. THE SCOT-HEART Trial

Pre-specified 5-year assessment of Coronary CT Angiography on:
- Coronary heart disease death or non-fatal myocardial infarction

Randomization 1:1
N=4,146

Standard of care
N=2,073

Data for primary 5-years endpoint
N=2,033

Standard of care + computed tomography coronary angiography
N=2,073

Data for primary 5-years endpoint
N=2,047
Primary Clinical End Point

<table>
<thead>
<tr>
<th>Follow up (years)</th>
<th>Hazard Ratio 0.59 (95% CI, 0.41 to 0.84)</th>
<th>P=0.004</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. at Risk</td>
<td>Standard care alone</td>
<td>CCTA + standard care</td>
</tr>
<tr>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>2</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>3</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>4</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>5</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Coronary Heart Disease Death or Non-fatal Myocardial Infarction

No. at Risk
- CCTA: 2073, 2051, 2029, 2015, 1588, 872

Hazard Ratio 0.59 (95% CI, 0.41 to 0.84) P=0.004
Non-fatal Myocardial Infarction

Hazard Ratio 0.60
(95% CI, 0.41 to 0.87)
P=0.007

No. at Risk
Standard care 2073 2045 2030 2017 1597 881
CCTA 2073 2057 2048 2041 1618 891

Follow up (years)
0 1 2 3 4 5

Non-fatal Myocardial Infarction

Standard care alone
CCTA + standard care
**Invasive Coronary Angiography and Coronary Revascularisation**

**Follow-up (years)**

<table>
<thead>
<tr>
<th>No. At Risk</th>
<th>Standard Care</th>
<th>CCTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Care</td>
<td>2073</td>
<td>1674</td>
</tr>
<tr>
<td></td>
<td>1639</td>
<td>1616</td>
</tr>
<tr>
<td></td>
<td>1251</td>
<td>678</td>
</tr>
<tr>
<td>CCTA</td>
<td>2073</td>
<td>1654</td>
</tr>
<tr>
<td></td>
<td>1625</td>
<td>1613</td>
</tr>
<tr>
<td></td>
<td>1258</td>
<td>656</td>
</tr>
</tbody>
</table>

**Hazard Ratio**

- **Invasive Coronary Angiography**
  - Hazard ratio 1.00 (95% CI, 0.88 to 1.13)  
  - P=0.993

- **Coronary Revascularisation**
  - Hazard Ratio 1.07 (95% CI, 0.91 to 1.27)  
  - P=0.409

**Follow-up (years)**

<table>
<thead>
<tr>
<th>No. At Risk</th>
<th>Standard Care</th>
<th>CCTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Care</td>
<td>2073</td>
<td>1865</td>
</tr>
<tr>
<td></td>
<td>1847</td>
<td>1834</td>
</tr>
<tr>
<td></td>
<td>1450</td>
<td>794</td>
</tr>
<tr>
<td>CCTA</td>
<td>2073</td>
<td>1827</td>
</tr>
<tr>
<td></td>
<td>1815</td>
<td>1806</td>
</tr>
<tr>
<td></td>
<td>1426</td>
<td>771</td>
</tr>
</tbody>
</table>

---

**ESC Congress**

**Munich 2018**

**Congress Highlights**

[Newby, 443]
Statin Therapy Use over 5 Years

**Frequency (%)**

*P<0.0001

**Follow up (years)**

0 1 2 3 4 5

**Coronary Artery Disease on CTCA**

**No Coronary Artery Disease on CTCA**

**10-Year Cardiovascular Risk (ASSIGN SCORE)**

5 10 20 30

**Standard Care Alone**

**CTCA + Standard Care**
Coronary CT Angiography and the Future Risk of Myocardial Infarction

The right patient gets the right treatment

- Coronary CT angiography guided management reduces 5-year coronary heart disease death or non-fatal myocardial infarction
- Early increases in invasive coronary angiography and coronary revascularisation are offset by lower rates beyond 1 year
- Benefits appear to be attributable to better targeted preventative therapies and coronary revascularisation
CRISP CT STUDY
The CRISP-CT study

Non-invasive detection of coronary inflammation by computed tomography analysis of pericoronary fat enhances cardiovascular risk prediction

Aim:
To assess the ability of the Perivascular Fat Attenuation Index (FAI) to predict clinical outcomes (all-cause and cardiac mortality)
Perivascular Fat Attenuation Index:
Technology detecting coronary inflammation on CCTA

Healthy, non-inflamed artery

“Healthy,” inflamed artery

△ Adipogenesis
△ Lipolysis
△ Oedema

Low FAI

Healthy

Heart attack 3y later

High FAI

Antonopoulos A et al. Science Translational Medicine 2017
FAI has prognostic value in predicting all-cause and cardiac mortality

Erlangen cohort

Cleveland cohort

Oikonomou E et al; Lancet 2018
FAI improves prediction of cardiac death over and above current state-of-the-art

**Model 1**: age, sex, hypertension, hypercholesterolaemia, diabetes mellitus, smoker status, epicardial fat volume, modified Duke CAD index and number of high-risk plaque features on CCTA.

**Model 2**: Model 1 + FAI
Fat Attenuation Index: a novel technology for CV risk stratification

- The perivascular FAI predicts mortality by providing a quantitative measure of coronary inflammation.

- The perivascular FAI may allow for risk restratification independently from the anatomical severity of coronary stenosis. High perivascular FAI values could guide targeted primary prevention and intensive secondary prevention.
The Clinical Impact of Stress CMR Perfusion Imaging in the United States (SPINS): A SCMR Registry Study

Study Objectives

- To evaluate the prognostic value of stress CMR in patients presenting with chest pain syndromes, in a real-world multicenter setting in the US
Primary Endpoint (CV death or AMI)

N=2,371 patients

- **Presence** of Ischemia or MI
  
  Kaplan Meier Survival Curve – CV Death or MI

  ![Graph showing survival rates with presence of ischemia or MI](image)

  - Ischemia & LGE negative
  - Ischemia or LGE positive

  P<0.0001

  Years

  Percent survival

- **Extent** of Ischemia or MI
  
  Kaplan Meier Survival Curve – CV Death or MI

  ![Graph showing survival rates with extent of ischemia or MI](image)

  - No Ischemia & LGE
  - Moderate Ischemia or LGE
  - Mild Ischemia or LGE

  P<0.0001

  Years

  Percent survival

- A negative stress CMR related to a low annual hard event rate of 0.6% over 4 years
- An abnormal study with both ischemia and scar related to a hard event rate of 3.5%
Microvascular dysfunction in heart failure with preserved ejection fraction: PROMIS-HFpEF

Aim:

- To investigate the prevalence of coronary microvascular dysfunction (CMD) and its association with systemic endothelial dysfunction, HF severity, and myocardial dysfunction in a prospective HFpEF population using a comprehensive functional imaging approach.
Results

After multivariable adjustment worse CFR was related to:

- higher NT-proBNP
- lower TAPSE, LV strain, LA strain, RV strain
PROMIS-HFpEF: Conclusions

- High prevalence of CMD in HFpEF (75%)
- CMD is associated with HF severity (↑NT-proBNP), systemic endothelial dysfunction, and cardiac dysfunction (↓LV, LA, RV strain)
LEFT ATRIUM SIZE AND MORTALITY
Left atrial enlargement and mortality: analysis of big data from the national echo database of Australia

Sub-analysis of patients with LAVI 26 – 39 ml/m² (other patients excluded) to identify **thresholds for increased mortality**

- Female LAVI sub-analysis (n=26,364)
  - >34 – 36 HR 1.63 (95% CI 1.4, 1.9) *
  - >36 – 38 HR 1.52 (95% CI 1.3, 1.8) *

- Male LAVI sub-analysis (n=28,635)
  - >35 – 37 HR 1.37 (95% CI 1.2, 1.5) *
  - >37 – 39 HR 1.42 (95% CI 1.3, 1.6) *

*Mortality increases significantly with LAVI >34 ml/m² in Females and >35 ml/m² in Males*
Conclusion

- LA enlargement is strongly associated with mortality above a size threshold, irrespective of the measurement method used.

- LAVI is an independent predictor of mortality above a threshold of 34 ml/m$^2$ in Females and 35 ml/m$^2$ in Males.
Coronary CT angiography-guided management reduces 5-year coronary heart disease death or non-fatal myocardial infarction.

The perivascular Fat Attenuation Index predicts mortality by providing a quantitative measure of coronary inflammation.

A negative stress CMR with no ischemia or scar experienced a low annual hard event rate.

Coronary Microvascular Dysfunction in HFpEF is associated with HF severity, systemic endothelial dysfunction, and cardiac dysfunction.

Left Atrial enlargement is strongly associated with mortality above a size threshold, irrespective of the measurement method used.