CORONARY ARTERY DISEASE IN AIRCREW MEMBERS: FROM THE DIAGNOSIS TO THE FLYING REHABILITATION. A FRENCH RETROSPECTIVE STUDY

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I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.

The opinions or assertions expressed here in are the private views of the authors and are not to be considered as official or as reflecting the views of the French Military Health Service.
Pilot suffers heart attack at Glasgow airport as he prepares to take off with 128 aboard

KLM captain on Amsterdam route was resuscitated by crew and a passenger after becoming unwell while heading for runway

A pilot's heart attack turned a United Airlines flight to Seattle into a dramatic scene where passengers attempted to save the pilot's life, and one of the co-pilot made an emergency landing in Boise, Idaho. The pilot died at the hospital, according to multiple reports.

If both pilots of an airplane were to die of simultaneous heart attacks, could the autopilot prevent a crash?

Quora
INTRODUCTION

- **Fitness for good cases:**
  - No symptoms
  - CVRF controlled
  - Monotroncicular, one stent
  - No residual ischemia
  - No necrosis sequelea
  - No diffuse atherosclerosis
  - No complication
  - After a 6-month period
  - No fighter pilot

**CAD=unfit?**

=> Case by case assessment
METHODS

• Aims of the study:
  • To describe the population of AM with a CAD
  • To evaluate the differences according to the clinical presentation (myocardial infarction, moderate symptoms, screening)
  • To study the arguments leading to the fitness decision
METHODS

Included population:
- Aircrew members examined in the AeMC of Clamart between 2010 and 2015
- History of coronary artery disease

86,691 files
Could be previous to 2010
METHODS

Analyzed Data:
• Age, sex, BMI, flight duty
• Cardio-vascular risk factors and SCORE risk
• Diagnosis, treatment, sequelae
• Fitness assessment
RESULTS AND DISCUSSION

• **120 AM with CAD:**
  • Mean age: 53.2+/-8.9yo
  • 98.3% males
  • 79.2% civilians
  • BMI: 26.7+/-3.1kg/m²

Incidences: 88 cases per 100,000 AM per year
(vs 400/100,000/y in French general population)
# CARDIOVASCULAR RISK

<table>
<thead>
<tr>
<th>CVRF</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>81(67.5)</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>49(40.8)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>49(40.8)</td>
</tr>
<tr>
<td>Family history</td>
<td>31(25.8)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>30(25)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>7(5.8)</td>
</tr>
<tr>
<td>Obesity</td>
<td>18(15)</td>
</tr>
<tr>
<td>Sedentarity</td>
<td>16(13.3)</td>
</tr>
</tbody>
</table>

**87% with 2 or more CVRF**

### SCORE risk
- < 1: low risk
- 1 à 5: moderated risk
- > 5: high risk
DIAGNOSIS

Including 2 pilots with in flight events

62% of them during physical activities

Clinical presentation

- Myocardial infarction 55%
- Moderate symptoms 23%
- Increased CVR 16%
- Systematic ECG 6%

- 66 cases
DIAGNOSIS

- Exercise test: 14 (Moderated symptoms n=28), 13 (CVR n=19), 3 (Systematic ECG n=7)
- Scintigraphy: 5, 5, 2
- CT scan: 1, 5, 0
- Coronarography: 28, 19, 7
DIAGNOSIS

LMCA: Left main coronary artery
LCX: Left circumflex artery
LAD: Left anterior descending artery
RCA: Right coronary artery

Monotroncircular and Bitrnoncircular
Tritroncircular
PCI: percutaneous coronary intervention
CABG: coronary artery bypass graft

Number of stent:
- 49
- 20
- 10
- 6
- 1
- 3

PCI n=89
CABG n=14
Dilatation n=6
None n=11
FITNESS ASSESSMENT

All AM were declared **unfit** by AeMC:

- Military AM: referred to the military aeromedical commission

- Civilian AM: referred to/ consultation with the licensing authority
FITNESS ASSESSMENT

Unfitness

- Sequelae/ischemia: 42%
- Unperformed tests: 33%
- Required by AM: 25%

Fitness

- Fit: 71%
- Unfit: 29%

Limitations

- Time limitation: 77/85
- Follow-up in our AeMC: 65/85
- Multi pilot limitation: 50/62
## CLINICAL PRESENTATION

<table>
<thead>
<tr>
<th></th>
<th>Myocardial infarction (n=66)</th>
<th>Moderate symptoms (n=28)</th>
<th>No symptom (n=26)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>27.06 ± 3.19</td>
<td>26.32 ± 3.12</td>
<td>26.30 ± 3.01</td>
<td>NS</td>
</tr>
<tr>
<td>Age (yo)</td>
<td>51.11 ± 8.03</td>
<td>53.86 ± 10.39</td>
<td>57.58 ± 7.98</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>number of CVRF</td>
<td>2.03 ± 1.09</td>
<td>2 ± 1.09</td>
<td>2.31 ± 1.09</td>
<td>NS</td>
</tr>
<tr>
<td>SCORE CV risk</td>
<td>1.52 ± 1.20</td>
<td>1.75 ± 2.40</td>
<td>3.64 ± 3.58</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Period between diagnosis and decision (months)</td>
<td>25.06 ± 36.9</td>
<td>23.71 ± 27.86</td>
<td>10.92 ± 4.92</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>
### CLINICAL PRESENTATION

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<thead>
<tr>
<th></th>
<th>Myocardial infarction (n=66)</th>
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<th>No symptom (n=26)</th>
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</thead>
<tbody>
<tr>
<td>Coronary lesion</td>
<td>LCX 30 (46.9%)</td>
<td>13 (46.3%)</td>
<td>22 (84.6%)</td>
</tr>
<tr>
<td>Treatment</td>
<td>Bypass 4 (6.1%)</td>
<td>7 (25%)</td>
<td>3 (11.5%)</td>
</tr>
<tr>
<td>Investigations</td>
<td>Normal TTE 26 (39.4%)</td>
<td>21 (75%)</td>
<td>19 (73.1%)</td>
</tr>
</tbody>
</table>

No significant difference for:
- crew duty
- civilian/military status
- **fitness decision**...
CAD SCREENING

- Importance of interrogatory, clinical examination and rest ECG at each visit
- Evaluation of the CV risk

Non invasive cardiological tests?
- Exercise ECG
- MRI
- MSCT

For what population?
- Only for high or moderate CV risk?
- Abnormal ECG
- Everybody over 40yo?
## FITNESS DECISION

<table>
<thead>
<tr>
<th></th>
<th>Fit (n=85)</th>
<th>Unfit (n=35)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m(^2))</td>
<td>26.66 ±3.24</td>
<td>26.88 ±3.11</td>
<td>NS</td>
</tr>
<tr>
<td>Age (yo)</td>
<td>52.38 ±8.25</td>
<td>55.03 ±9.32</td>
<td>NS</td>
</tr>
<tr>
<td>Number of CVRF</td>
<td>2.06 ±1.08</td>
<td>2.15 ±1.10</td>
<td>NS</td>
</tr>
<tr>
<td>SCORE CV risk</td>
<td>1.69 ±1.60</td>
<td>3.07 ±1.78</td>
<td>NS (0.13)</td>
</tr>
<tr>
<td>Period between diagnosis and decision (months)</td>
<td>18.48 ±27.36</td>
<td>29.46 ±34.08</td>
<td>NS</td>
</tr>
</tbody>
</table>
## FITNESS DECISION

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<thead>
<tr>
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<th>Fit (n=85)</th>
<th>Unfit (n=35)</th>
<th>p value</th>
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<tbody>
<tr>
<td><strong>Crew duty</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private pilot</td>
<td>20 (23.5%)</td>
<td>18 (51.4%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Professional pilot</td>
<td>↑ 39 (45.9%)</td>
<td>9 (25.7%)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td><strong>Coronary lesion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal LAD</td>
<td>23 (28.4%)</td>
<td>↑ 17 (50%)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Holter ECG</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>↑ 70 (82.4%)</td>
<td>21 (60%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td><strong>Exercise test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>↑ 52 (61.2%)</td>
<td>13 (37.1%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td><strong>Scintigraphy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>↑ 26 (30.6%)</td>
<td>3 (8.6%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td><strong>TTE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td>↑ 53 (62.4%)</td>
<td>13 (37.1%)</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

No significant difference for: civilian/military status, clinical presentation (myocardial infarction, no symptom), mono/bi/tritroncular lesion…
REHABILITATION

• What is actually a bad case?
  • Cardio-vascular risk
  • Clinical presentation
  • Mono/multitroncicular lesion
  • Number of stent

• Necrosis sequelae
• Ischemia
• Aircrew duty

not in our study

Need for sensitive and specific tests
MAIN FEATURES OF AM WITH CAD

- Presentation: myocardial infarction (55%)
- CVR: low or moderate (93%)
- At least 2 CVRF (especially age, smoking, dyslipidemia)
- Bi or triconcircular lesions (52%)
- >1/3 with lesion on proximal LAD or LMCA
- Treated with PCI (≥ 2 stents in 45% of cases)
- Declared fit (71%), multi pilot limitation (81%)
CONCLUSION

- 55% of AM with myocardial infarction
  ✗ Improvement of CAD screening is necessary

- Sequelae/ischemia: major cause of unfitness
  ✗ Importance of a good evaluation (stress MRI)

- Prevention remains essential