What can we learn from the non-aneurysmal infra-renal aortic diameter?

Paul Norman
University of Western Australia
Diameter thresholds for AAA

- $\geq 30\text{mm}$ for diagnosis
- 50-55mm for intervention
- Is $<30\text{mm}$ always normal?
Not always

…….because of increased risk of:

– future AAA
– other Cardiovascular Disease
Distribution of aortic diameters in men aged 65yrs+ (n=12,203)
Non-aneurysmal diameter and risk of future AAA
Re-screening studies

• ~33% men with diameters 26-29mm had AAA on re-screen at 3-5yrs
  Lindholt JS et al. EJVES 2000;20:369-73

• 2.2% subjects had AAA on re-screen at 4yrs but 71% of these were <25mm at initial screening

• 2.8% men had AAA on re-screen at 5yrs
  Hafez H et al. EJVES 2008;36:553-8
Risk of AAA for aortic diameters <30mm Tromsø Study

Solberg S et al. EJVEVS 2010;39:28-4
WA trial: events in men with diameters <30mm at screening (n=11,328)

- 10 years of Follow-up
- 2 deaths from rupture:
  - 25mm with rupture 5 yrs later aged 75
  - 27mm with rupture 5yrs later aged 77
- 23 elective interventions (no deaths):
  - 21-28mm at screening
  - 4-10 years later
WA trial: events in men with diameters <30mm at screening (n=11,328)
Ruptured in men originally screened as normal in MASS trial

Thompson S G et al. BMJ 2009;338:bmj.b2307
Interpretation

• For diameters 25-29mm in men:
  – there is a 2X risk of AAA by ~6-7 yrs
  .............and of rupture after ~8yrs
  – re-screening at ~5yrs should be considered
  – ? Less important in diabetes
Non-aneurysmal diameter and risk of other CVD
Non-aneurysmal diameter predicts CVD events (n=12,203 men aged 65+yrs)
Population-based studies of diameter and mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>Number and gender</th>
<th>Mean age</th>
<th>Reference diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>12,203 M</td>
<td>~73yrs</td>
<td>19-22</td>
</tr>
<tr>
<td>Tromsø¹</td>
<td>6,640 M+F</td>
<td>~60yrs</td>
<td>21-23</td>
</tr>
<tr>
<td>CVH²</td>
<td>4,734 M+F</td>
<td>~75yrs</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Scotland³</td>
<td>8,146 M</td>
<td>~70yrs</td>
<td>&lt;24</td>
</tr>
</tbody>
</table>

Population-based studies of non-aneurysmal diameter and mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>Reference diameter (mm)</th>
<th>Enlarged diameter (mm)</th>
<th>CVD death HR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA</td>
<td>19-22</td>
<td>23-26</td>
<td>1.3 (1.1,1.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27-29</td>
<td>1.4 (1.1, 1.7)</td>
</tr>
<tr>
<td>Tromsø</td>
<td>21-23</td>
<td>24-26</td>
<td>1.2 (0.9,1.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27-29</td>
<td>1.9 (1.2, 2.8)</td>
</tr>
<tr>
<td>CVH</td>
<td>20</td>
<td>20-30</td>
<td>1.2 (1.02,1.4)</td>
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<td>&lt;24</td>
<td>25-29</td>
<td>1.2 (1.04, 1.4)</td>
</tr>
</tbody>
</table>
Estimated risk

- Upper limit of reference range probably ~23mm in men
- CVD death increased by ~5% per mm above this
- 15-20% of men aged 65+ yrs have diameters in the 23 -30mm range
- This is independent of other CVD risk factors and not due to AAA deaths
Why does diameter predict CVD death?

• May just be a surrogate (like aortic stiffness or calcification)

• Enlarged wall may:
  – release pro-inflammatory cytokines (eg I-L6)
  – cause mural thrombus (and D-dimer release)
Can an aorta be too small?
Conclusions

• Aortic diameter of ~19-22mm is probably normal in older men
• Aortic diameter of ~23-29mm is not normal
  – 25-29mm: risk of future AAA
  – 23-29mm: risk of other CVD
• Aortic diameter <19mm may not be normal
  – risk of other CVD
Future implications

• Aortic diameter is a simple marker of global cardiovascular risk
• Available in all men attending for screening at no extra cost
• What do we do about it?
  – ? modify risk factors
  – ? need for trial of active intervention
Acknowledgements

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