Coronary Rupture, Perforation and Tamponade
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University Hospital of North Staffordshire
CONFLICTS OF INTEREST:

Sponsorship to attend meetings from:
Medtronic
Boston Scientific
Eli-Lilly
Cordis

Advisory group:
Eli Lilly

Preceptor for Rotational Atherectomy:
Boston Scientific

Lecturing Fees:
Medtronic
Pfizer
Astra Zeneca
Spectrum of pathology ... 

- wire exit

- distal branch perforation

- mid-vessel rupture
Ellis classification ..... *Circ* 1994

- **Class I**
  extraluminal crater without extravasation

- **Class II**
  pericardial or myocardial blush / no contrast jet

- **Class III**
  extravasation through >1mm perforation

- **Class IV**
  extravasation into a chamber or coronary sinus not pericardial space
So ..... Coronary perforations .......

Should we be concerned?

Any data?
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Number</th>
<th>Perforation</th>
<th>Tamponade</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Von Sohsten</td>
<td>2000</td>
<td>6999</td>
<td>15 (0.2%)</td>
<td>0</td>
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</tr>
<tr>
<td>Gruberg</td>
<td>2000</td>
<td>30746</td>
<td>84 (0.3%)</td>
<td>26 (0.1%)</td>
<td>8</td>
</tr>
<tr>
<td>Fejka</td>
<td>2002</td>
<td>25697</td>
<td>31 (0.1%)</td>
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<tr>
<td>Fukutomi</td>
<td>2002</td>
<td>7443</td>
<td>69 (0.93%)</td>
<td>26 (0.3%)</td>
<td>0</td>
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<tr>
<td>Gunning</td>
<td>2002</td>
<td>6245</td>
<td>52 (0.8%)</td>
<td>24 (0.4%)</td>
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<tr>
<td>Fasseas</td>
<td>2003</td>
<td>16298</td>
<td>95 (0.6%)</td>
<td>11 (0.1%)</td>
<td>7</td>
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<tr>
<td>Eggebrecht</td>
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<td>19 (0.3%)</td>
<td>3 (0.05%)</td>
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<tr>
<td>Witzke</td>
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<td>12658</td>
<td>39 (0.3%)</td>
<td>7 (0.05%)</td>
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</tr>
<tr>
<td>Ramana</td>
<td>2005</td>
<td>4886</td>
<td>25 (0.5%)</td>
<td>4 (0.01%)</td>
<td>2</td>
</tr>
<tr>
<td>Javaid</td>
<td>2006</td>
<td>38559</td>
<td>72 (0.2%)</td>
<td>14 (0.03%)</td>
<td>12</td>
</tr>
<tr>
<td>Shirakabe</td>
<td>2007</td>
<td>3415</td>
<td>12 (0.4%)</td>
<td>3 (0.01%)</td>
<td>1</td>
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</table>
Tamponade is bad news
Mechanism of perforation ...........
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Wire causative</th>
<th>Rota</th>
<th>DCA</th>
<th>Laser</th>
<th>TPW</th>
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</thead>
<tbody>
<tr>
<td>Von Sohsten</td>
<td>2000</td>
<td>5/15 (33%)</td>
<td>8/15**</td>
<td>2/15</td>
<td></td>
<td>7/15</td>
</tr>
<tr>
<td>Gruberg</td>
<td>2000</td>
<td>19/84</td>
<td>7/84</td>
<td>14/84</td>
<td></td>
<td></td>
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<tr>
<td>Fejka</td>
<td>2002</td>
<td>10/31 (33%)</td>
<td>5/31</td>
<td>1/31</td>
<td>1/31</td>
<td>2/31</td>
</tr>
<tr>
<td>Fukutomi</td>
<td>2002</td>
<td>27/69 (39%)</td>
<td></td>
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<td></td>
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<tr>
<td>Gunning</td>
<td>2002</td>
<td>4/52</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Fasseas</td>
<td>2003</td>
<td>29/95 (31%)</td>
<td>6/95</td>
<td>3/95</td>
<td>8/95</td>
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<tr>
<td>Witzke</td>
<td>2004</td>
<td>20/39 (51%)</td>
<td>?</td>
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<td></td>
</tr>
<tr>
<td>Ramana</td>
<td>2005</td>
<td>17/25 (68%)</td>
<td>2/25 (causative)</td>
<td></td>
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<tr>
<td>Javaid</td>
<td>2006</td>
<td>15/72 (21%)</td>
<td>14/72</td>
<td></td>
<td>7/72</td>
<td></td>
</tr>
<tr>
<td>Shirakabe</td>
<td>2007</td>
<td>3/12 (25%)</td>
<td>3/12</td>
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</tbody>
</table>

Other mechanisms .. Post dilatation, de novo POBA, de novo stent deployment
Which patients .... ?

• Age - Older ..... >65 years

• No Gender predominance

• Lesion type B2 and C ..... 70-95%

• Chronic occlusion 20-30%

• diabetics 20%
Late presentation of tamponade

• > 2 hours post-procedure

• Frequency 10 - 60% of documented perforations

• Retrospectively associated with wire perforation

• Associated with abciximab (80% Gunning et al)

• so does GPIIb/IIIa use confer risk?
Fasseas et al.
More likely to require surgery (24% vs 3%)
More likely to develop tamponade (15% vs 9%)
No difference in mortality, no difference in MI

Others suggest no association with adverse outcome with IIb/IIa and perforation

Witzke et al.  J Invasive Cardiol 2004
Gunning et al Heart 2002
No. patients with haemodynamically significant coronary perforation
Management .. ?
Depends on grade / severity

Wire perforation
- Often benign
- *Often unreported*
- supportive hydrophilic wires

May respond to
- reversal of heparin
- observation
- balloon tamponade
If there is tamponade …

• Aspirate …..

• Set up auto-transfusion circuit

• monitor drainage

• Do not rely on free drainage

• If not resolving consider surgery
The covered stent ...

Polytetrafluoroethylene

Usage sporadic

Effective

Difficult to position

? No clear outcome benefit demonstrated

Javaid, Ly,
For distal perforations ....

- Coil embolisation
- Adipose tissue
- Bio-glue
- polyvinyl alcohol
- autologous blood
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Emergency surgery</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Von Sohsten</td>
<td>2000</td>
<td>9/15 (60%)</td>
<td>0</td>
</tr>
<tr>
<td>Gruberg</td>
<td>2000</td>
<td>33/84 (39%)</td>
<td>6/33 (18%)</td>
</tr>
<tr>
<td>Fejka</td>
<td>2002</td>
<td>12/31 (39%)</td>
<td>6/12 (50%)</td>
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<td>0</td>
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<td>8/52 (15%)</td>
<td>3/8 (38%)</td>
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<td>10/95 (21%)</td>
<td>?</td>
</tr>
<tr>
<td>Witzke</td>
<td>2004</td>
<td>2/39 (5.2%)</td>
<td>1/2 (50%)</td>
</tr>
<tr>
<td>Javaid</td>
<td>2006</td>
<td>25/72 (35%)</td>
<td>?</td>
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</table>
So surgery not definitive solution to the problem
Final thoughts ..........

• Avoid the problem
• Recognise it early
• Monitor fastidiously
• Drain tamponade early
• Employ niche products
• Care with IIb/IIIa
Thank you !!