CO2 Digital Subtraction Angiography in Peripheral Artery Disease

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Disclosures

None
CO2 in Peripheral Angiography

- Key studies in CO2 angiography of the lower extremities
  - Limitations
  - Safety
  - Benefits

- Strategies for Improving CO2 imaging in peripheral arterial disease
Combined CO2 and Iodinated Contrast (ICM)

- 191 patients with peripheral artery disease
- 154 with ICM only versus 37 with CO2/ICM hybrid

Combined CO2 and Iodinated Contrast (ICM)

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Combined CO2 and Iodinated Contrast (ICM)

- Prospective study of 98 patients with CKD
  - 31 Aortoiliac
  - 62 fem/pop
  - 16 renal artery
- Technical Success rate of 97.9%
- Mean iodinated contrast use 15.0 ± 18.1 ml (range 0–70 ml).

Fig. 3. eGFR following CO₂ angiography.
CO2 in Peripheral Angiography

• 50 consecutive patients with peripheral arterial disease
• Patients had both full CO2 followed by iodinated contrast studies

CO2 in Peripheral Angiography

- 50 consecutive patients with peripheral arterial disease
- Patients had both full CO2 followed by Iodinated contrast studies

<table>
<thead>
<tr>
<th>Vascular Bed</th>
<th>Stenosis(CO2)/Normal (ICM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta</td>
<td>3</td>
</tr>
<tr>
<td>Pelvis</td>
<td>6</td>
</tr>
<tr>
<td>Thighs</td>
<td>3</td>
</tr>
<tr>
<td>Knees</td>
<td>4</td>
</tr>
<tr>
<td>Legs</td>
<td>1</td>
</tr>
<tr>
<td>Feet</td>
<td>1</td>
</tr>
</tbody>
</table>

CO2 in Peripheral Angiography

<table>
<thead>
<tr>
<th>Total Patients (50)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain with injection</td>
<td>24 (48%)</td>
</tr>
<tr>
<td>Discontinued due to pain</td>
<td>9 (18%)</td>
</tr>
<tr>
<td>Unable to visualize feet vessels</td>
<td>37 (75%)</td>
</tr>
<tr>
<td>“Complete” Angiograms</td>
<td>18 (36%)</td>
</tr>
</tbody>
</table>

CO2 in Peripheral Angiography

“CO2 imaging was not of sufficient quality to permit diagnosis”

Safety of CO2 in peripheral angiography

- 527 aortograms with or without extremity runoff
- 31 were extremity only
- Iodinated contrast media used in 52%
- Median iodinated contrast used was 15 ml

## Safety of CO2 in peripheral angiography

<table>
<thead>
<tr>
<th>Complications</th>
<th>% (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puncture site hematoma</td>
<td>8 (13)</td>
</tr>
<tr>
<td>Transient abdominal pain</td>
<td>6 (10)</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>4 (7)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Intimal dissection</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Tachyarrhythmia</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Severe hypertension</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Hives</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Seizure</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>

# Procedural Creatinine

<table>
<thead>
<tr>
<th>Quartiles of CKD</th>
<th>Before mg/dL, Mean (SD)</th>
<th>After mg/dL, Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.2</td>
<td>0.9 (0.2)</td>
<td>0.9 (0.3)</td>
<td>.16</td>
</tr>
<tr>
<td>1.3-1.9</td>
<td>1.6 (0.2)</td>
<td>1.6 (0.5)</td>
<td>.13</td>
</tr>
<tr>
<td>&gt;2</td>
<td>3.1 (1.3)</td>
<td>3.2 (1.6)</td>
<td>.30</td>
</tr>
<tr>
<td>Total</td>
<td>2.1 (1.2)</td>
<td>2.1 (1.4)</td>
<td>.25</td>
</tr>
</tbody>
</table>

Adopting CO2 at Tulane
Adopting CO2 at Tulane (in Cardiology)
“Why not use CO2 for that?”

Jim Caridi MD
Strategies for Optimizing CO2 Peripheral Angiograms
Image Stacking is Essential
End Hole Catheters are Better
Non-Selective Imaging with CO2
Non-Selective From Radial
The Paddle
CO2 versus contrast in bleeding
CO2 versus contrast in bleeding
CO2 versus contrast in bleeding
Save the Contrast for the Intervention
• 56 year old diabetic man with severe left leg claudication and an ankle brachial index of 0.4, serum creatinine 1.0 mg/dL
Conclusions

• CO2 is safe and effective at reducing contrast use in peripheral angiography and interventions
• Strategies can be used to improve angiogram quality
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