Uptake of $^{18}$F-FDG: New Predictor for Type B IMH Progression

Jianfang Luo, MD FACC FESC
Director, Vascular Center
Guangdong Cardiovascular Institute
Guangdong General Hospital
Guangzhou, China
Disclosure

Speaker name: Jianfang Luo.

I have the following potential conflicts of interest to report:
- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

- I do not have any potential conflict of interest
Intramural haematoma (IMH)

IMH develops in the media of the aortic wall in the absence of an false lumen and intimal tear.

Crescentic or circular aortic wall thickening on CT > 5 mm in the absence of detectable blood flow.
International Registry of Aortic Dissection (IRAD)

- Type B IMH 58%
- In-hospital mortality was 4%

Intramural hematomas with focal areas of dissection demonstrated 80% and 40% 5- and 8-year freedom from dissection-related mortality
Predictors of IMH Complications

1. Persistent and recurrent pain despite aggressive medical treatment
2. Difficult blood pressure control
3. Maximum aortic diameter ≥40 mm
4. Detection of organ ischemia

*EUR HEART J. 2014;35(41):2873-2926*
Progressive Maximum Aortic Wall Thickness (>10 mm)

Ulcer-like Projection in the Involved Segment

Recurrent Pleural Effusion

EUR HEART J. 2014;35(41):2873-2926
Uptake of $^{18}$F-FDG: The New Predictor For Type B IMH

Experimental Basis

$^{18}$F-FDG uptake were enriched in leukocytes.

Acute inflammation reaction and repair process result in accumulation of hypermetabolic cells such as macrophages.

Positron Emission Tomography/Computed Tomography (PET/CT)
PET/CT Imaging Evaluation

CTA
- Initial ULP
- Maximum aortic diameter

PET
- Maximum standardized uptake value of aortic wall (SUVmax)
- Maximum standardized uptake value of liver (SUVliver)
- SUVratio (SUVmax divided by SUVliver)
Definition of Adverse Aortic Event (AAE)

- Conversion to TEVAR (clinical and/or morphologic deterioration)
- Development of AD with intimal flap (classic or localized)
- Enlargement of initial ULP
- Newly developed ULP
- Aortic enlargement (≥50mm or increased by 25%)
## Patient Characteristics (Mar.2015 - Mar.2016)

<table>
<thead>
<tr>
<th></th>
<th>Total (N=34)</th>
<th>AAEs(n=18)</th>
<th>NO AAEs (n=16)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>57.97±9.18</td>
<td>57.56±10.07</td>
<td>58.44±8.37</td>
<td>0.986</td>
</tr>
<tr>
<td>Male/female</td>
<td>28/6</td>
<td>15/3</td>
<td>13/3</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Heart rate, bpm</td>
<td>75.91±10.6</td>
<td>76.72±11.74</td>
<td>75±9.45</td>
<td>0.670</td>
</tr>
<tr>
<td>Onset time, d</td>
<td>4.06±2.89</td>
<td>3.61±2.55</td>
<td>4.56±3.25</td>
<td>0.484</td>
</tr>
<tr>
<td>Smoke, n(%)</td>
<td>12(35.3)</td>
<td>7(38.9)</td>
<td>5(31.3)</td>
<td>0.729</td>
</tr>
<tr>
<td>Hypertension, n(%)</td>
<td>31(91.2)</td>
<td>18(100.0)</td>
<td>13(81.3)</td>
<td>0.094</td>
</tr>
<tr>
<td>Hyperlipidemia, n(%)</td>
<td>5(14.7)</td>
<td>4(22.2)</td>
<td>1(6.3)</td>
<td>0.340</td>
</tr>
<tr>
<td>Diabetes mellitus, n(%)</td>
<td>2(5.9)</td>
<td>1(5.6)</td>
<td>1(6.3)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Coronary artery disease,n(%)</td>
<td>4(11.8)</td>
<td>2(11.1)</td>
<td>2(12.5)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Renal insufficiency, n(%)*</td>
<td>4(11.8)</td>
<td>4(22.2)</td>
<td>0(0)</td>
<td>0.105</td>
</tr>
<tr>
<td>Pneumonia, n(%)</td>
<td>2(5.9)</td>
<td>1(5.6)</td>
<td>1(6.3)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Visceral ischemia, n(%)</td>
<td>2(5.9)</td>
<td>1(5.6)</td>
<td>1(6.3)</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Pleural effusion, n(%)</td>
<td>6(17.6)</td>
<td>5(29.4)</td>
<td>1(6.3)</td>
<td>0.175</td>
</tr>
</tbody>
</table>
## Early Progression of IMH

<table>
<thead>
<tr>
<th>Patients</th>
<th>N=34</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Follow-up period, day (M)</strong></td>
<td>42 ( 33.63)</td>
</tr>
<tr>
<td>Composite endpoint (AAEs), n(%)</td>
<td>18 (52.9)</td>
</tr>
<tr>
<td>TEVAR, n(%)</td>
<td>3 (8.8)</td>
</tr>
<tr>
<td>Development to aortic dissection, n(%)</td>
<td>12 (35.3)</td>
</tr>
<tr>
<td>Enlargement of initial ULP, n(%)</td>
<td>14 (41.2)</td>
</tr>
<tr>
<td>New appearance of ULP, n(%)</td>
<td>7 (20.6)</td>
</tr>
<tr>
<td>Aortic dilation, n(%)</td>
<td>4 (11.8)</td>
</tr>
</tbody>
</table>

Values are presented as n (%) or median (25th-75th percentile).
IMH, intramural hematoma; TEVAR, thoracic endovascular repair; ULP, ulcer like projection.
### Laboratory, Morphologic and Metabolic findings

<table>
<thead>
<tr>
<th></th>
<th>Total (n=34)</th>
<th>AAEs (n=18)</th>
<th>No AAEs (n=16)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2-dimer, μg/L</td>
<td>1460 (650-3135)</td>
<td>1855 (690-3105)</td>
<td>1110 (540-3140)</td>
<td>0.630</td>
</tr>
<tr>
<td>CRP, mg/L</td>
<td>87.5 (35-123.8)</td>
<td>86.3 (53.8-128.5)</td>
<td>87.5 (9.8-110.5)</td>
<td>0.377</td>
</tr>
<tr>
<td>MAD, mm</td>
<td>36.5±4.95</td>
<td>36.83±4.23</td>
<td>36.4±5.87</td>
<td>0.772</td>
</tr>
<tr>
<td>ULP, n(%)</td>
<td>25 (73.5)</td>
<td>15 (83.3)</td>
<td>10 (62.5)</td>
<td>0.250</td>
</tr>
<tr>
<td>SUVmax</td>
<td>4.03±0.82</td>
<td>4.29±0.58</td>
<td>3.73±0.98</td>
<td><strong>0.020</strong></td>
</tr>
<tr>
<td>SUVratio</td>
<td>1.25±0.2</td>
<td>1.28±0.13</td>
<td>1.24±0.27</td>
<td>0.144</td>
</tr>
</tbody>
</table>

Values are presented as n (%), mean±SD or median(25th-75th percentile).
ULP, ulcer like projection; SUV, standardized uptake value.
MAD, maximum aortic diameter, mm
Mean area under the curve (AUC) was $0.827 \pm 0.084$.

The optimal SUVratio cutoff point was $1.226$.

Sensitivity of $73.3\%$, specificity of $90.0\%$

### Patients with Ulcer-like Projection

<table>
<thead>
<tr>
<th></th>
<th>AAEs (n=15)</th>
<th>No AAEs (n=10)</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUVmax</td>
<td>4.33±0.63</td>
<td>3.32±0.53</td>
<td>0.001</td>
</tr>
<tr>
<td>SUVratio</td>
<td>1.29±0.14</td>
<td>1.12±0.11</td>
<td>0.005</td>
</tr>
</tbody>
</table>
A 55-y-old man with greater uptake of 18F-FDG in the aortic wall:

A, ULP were detected at the middle descending aorta in initial CTA;
B-C, accumulation of 18F-FDG in the aortic wall in PET/CT, the SUVmax and SUVratio were 4.8 and 1.33, respectively;
D, ULP progressed to classic dissection 1 mo after onset.
A 52-y-old man with low uptake of 18F-FDG in the aortic wall:

**A**, ULP were detected at the proximal descending aorta in initial CTA;

**B-C**, No obvious accumulation of 18F-FDG in the aortic wall on PET/CT, the SUVmax and SUVratio were 2.7 and 1.13, respectively;

**D**, ULP had no change 35 days after onset.
Patients having ULP with greater uptake of 18F-FDG in the aortic wall were more likely to develop into AAEs.

18F-FDG PET/CT may provide a new approach for predicting risk in patients with type B IMH.

Endovascular treatment for patients with ULP +SUV max↑?

More careful surveillance with imaging is recommended for high-risk patients.
THANK YOU

Danke
Objectives

- Investigate the role of $^{18}$F-FDG uptake on positron emission PET/CT images in predicting the deteriorative risk in patients with acute type B IMH.
Uptake of \(^{18}\)F-FDG: New Predictor for Type B IMH Progression

Jianfang Luo, MD FACC FESC
Director, Vascular Center
Guangdong Cardiovascular Institute
Guangdong General Hospital
Guangzhou, China