Measurement of Flow-mediated vasodilatation in patients with history of Kawasaki disease

Department of Pediatric Cardiology and Nephrology Graduate School of Medical Science, Kyoto Prefectural University of Medicine


**Background**

It is well known that some patients with history of Kawasaki disease (KD) develop post-inflammatory arteriosclerosis, and that calcification is usually observed in some of these patients with massive CAL. The mechanism of calcification of KD patients is not well understood.

Coronary artery calcification is considered as one of the risk factor of mortal cardiac events.

**Purpose**

We investigated the endothelial function in patients with history of KD by using FMD and estimated its utility to predict the occurrence of coronary artery calcification.

**What is Flow-mediated vasodilatation?**

- **mild**
  - Degree of Vascular Damage
  - Functional Damage(+)
  - FMD
  - PWV, Stiffness parameter β, Augmentation index, etc.
  - Early detection and intervention is crucial.

- **severe**
  - Degree of Vascular Damage
  - Severe Structural Damage(+)
  - Carotid Artery Ultrasound, Intravascular ultrasound, CT, MRI, etc.

The flow-mediated vasodilatation (FMD) utilizes reactive hyperemia induced by the release of vascular endothelial nitric oxide. FMD is regarded as the earliest stage of endothelial function in recent years due to its sensitivity.

※ It has been reported that %FMD is correlated with the degree of coronary damage and as useful to detect early stages of arteriosclerosis in adults (Hirooka Y, et al. Am. Coll. Cardiol. 1994; 24: 948).

**Results**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>n</th>
<th>M ± F</th>
<th>Age (Years)</th>
<th>CAL(-)</th>
<th>CAL(+) ca (-)</th>
<th>CAL(+) ca (+)</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(n=17)</td>
<td>(n=12)</td>
<td>(n=13)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>17 ± 9</td>
<td>7-33 median: 17</td>
<td>15.9 ± 17.7</td>
<td>22 ± 6.7</td>
<td>21.3 ± 6.7</td>
<td>p=0.0012</td>
<td></td>
</tr>
<tr>
<td>Diameter (mm)</td>
<td>3.1 ± 0.6</td>
<td>3.4 ± 0.9</td>
<td>3.8 ± 0.4</td>
<td>p=0.0063</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%FMD (%)</td>
<td>11.2 ± 4.9</td>
<td>8.5 ± 1.7</td>
<td>6.6 ± 1.3</td>
<td>p=0.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CAL: coronary artery lesion ca: calcification

- p<0.05 vs CAL(-) group
- p<0.05 vs CAL(+)ca(+) group

**Discussion**

The most affective factors of %FMD are age and diameter of brachial artery. In this study, we could find the correlation only between %FMD and diameter.

In the guidelines for FMD, it is considered that we do not need diameter-adjusted analyses.


→ It does not matter that there are differences among age and diameter of three groups in statistical analyses.

The %FMD values of the CAL(+) group were significantly lower compared with the CAL(-) group.

→ The endothelial function of CAL(+) group suffers more strongly than that of CAL(-) group.

In the CAL(+) group, the %FMD values of the calcification(+) group were significantly lower compared with the calcification(-) group.

→ The endothelial function of calcification(+) group suffers more strongly than that of calcification(-) group.

**Methods**

**Subjects:** 42 Patients with history of KD

<table>
<thead>
<tr>
<th>n</th>
<th>M ± F</th>
<th>Age (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL(-)</td>
<td>17</td>
<td>8 : 9</td>
</tr>
<tr>
<td>CAL(+) ca (-)</td>
<td>12</td>
<td>4 : 8</td>
</tr>
<tr>
<td>CAL(+) ca (+)</td>
<td>13</td>
<td>13 : 0</td>
</tr>
</tbody>
</table>

CAL: coronary artery lesion ca: calcification

**Protocol for Measurement:**

1. Measure the diameter of the brachial artery after resting for 10 minutes in a dark, quiet, and temperature-controlled (23-26°C) room
2. Occlude the brachial artery for 5 minutes with the cuff (at systolic blood pressure + 50mmHg)
3. Measure the maximum diameter after cuff release
4. Calculate the change rate of the diameter (=%FMD)

%FMD (%) = (B – A) × 100

A: the diameter at rest
B: the maximum diameter after cuff release

**Conclusion**

The measurement of FMD may predict the occurrence of arteriosclerosis or calcification in patients with past history of KD.

%FMD is considered as one of the most important indices to evaluate the progressive changes toward arteriosclerosis in KD chronic phase.