Severe heart disease can cause diabetes mellitus even in younger age:
Case reports of two Japanese adolescent boys.

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INTRODUCTION
It is noted that patients with congenital heart disease (CHD) are likely to develop abnormal glucose metabolism and this metabolic deterioration usually occurs after middle age. However, we recently had two patients with CHD, who developed type 2 diabetes mellitus (DM) in their adolescence.

CASE PRESENTATION

Case 1 : Seventeen-year-old boy

Perinatal history
He was born at 37w0d of gestation weighting 2628g, with single-ventricle, atrium/ventricular septum defect and pulmonary atresia.

Past history
One years old: Glenn shunt
Two years old: Fontan operation

Familial history
Grand father had DM.

Complication
hypoxic-ischemic encephalopathy, symmetric epilepsy, severe mental retardation

Present illness
He had been treated by a pediatric cardiologist on our hospital since he was 11 years old. When he was 14 years old, he visited our hospital because of thirst and polyuria that lasted for a week. He was not obese (160.0cm in height, 35.5kg in weight, and 13.87 kg/m2 in body mass index (BMI) at that time. Laboratory data and glucagon test proved that he had Type 2 DM. He has been administered Metformin 1500mg daily.

Laboratory data
<table>
<thead>
<tr>
<th>Glu (mg/dl)</th>
<th>pH</th>
<th>BNP (μl/ml)</th>
<th>GADAg (μl/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>7.33</td>
<td>3.6</td>
<td>5.0</td>
</tr>
</tbody>
</table>

BNP: N-terminal pro brain natriuretic peptide (BNP), GADAg: Glucagon, Glu: blood glucose; IR: insulin, CPR: C-peptide

Glucagon test:
CPR: 1.07, 2.46, 2.84, 3.58, 2.54 (ng/ml)

BG: blood glucose, IR: insulin, CPR: C-peptide, BNP: B-type natriuretic peptide

Evaluation of glucose tolerance by OGTT

<table>
<thead>
<tr>
<th>Rate (%)</th>
<th>Age (years)</th>
<th>BMI (kg/m2)</th>
<th>BNP (μg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>21±5</td>
<td>22±2</td>
<td>9±3</td>
</tr>
<tr>
<td>30</td>
<td>27±8</td>
<td>21±4</td>
<td>56±72</td>
</tr>
<tr>
<td>60</td>
<td>22±5</td>
<td>20±3</td>
<td>40±62</td>
</tr>
<tr>
<td>90</td>
<td>22±10</td>
<td>19±4</td>
<td>205±536</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Control, BVR, Fontan, Unrepaired

In addition, there is a report that the group of patients with cyanotic heart disease have higher risk of developing diabetes than non-cyanotic heart disease.

Hazard Ratio of diabetes development in patients with CHD

<table>
<thead>
<tr>
<th>CHD</th>
<th>Hazard Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanotic</td>
<td>2.85</td>
<td>1.77-4.57</td>
</tr>
<tr>
<td>Acyanotic</td>
<td>1.35</td>
<td>1.02-1.77</td>
</tr>
</tbody>
</table>

Case 2 had high BNP levels and hypoxemia so that he had higher risk of DM. On the other hand, in our case 1, the BNP level was in normal range. However he had hypoxemia. It was reported that the risk of developing DM is similar regardless of the degree of heart failure in patients with CHD 1). The risk of developing diabetes cannot be evaluated accurately by the BNP value only. Our 2 cases indicate that cyanotic CHD patients might have higher risk of developing DM even in adolescence and even with fair management of heart failure.

CONCLUSION

● Patients with congenital heart disease have higher risk of impaired glucose tolerance in childhood and young adulthood.
● Even if they are not obese, it may be needed to evaluate blood glucose level or Hba1c, regularly.

REFERENCE


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