Background
- Improvements in perinatal care have resulted in increased survival rates for children born very preterm. The incidence of major disabilities such as cerebral palsy, mental retardation is fairly low. Knowledge regarding neuropsychological outcome of school-aged children with CHD born less than 1500g is limited.

Objectives
The purpose of the study was to determine the intellectual function of prematurely born school-aged children with CHD.

Methods
- We reviewed all VLBWI (born less than 1500g) admitted in our neonatal intensive care unit (NICU) from January 2000 to December 2006. Patients were divided in two groups, CHD and no-CHD group.
- The diagnosis of CHD was made by echocardiography.
- Isolated patent duct arteriosus, patent foramen ovale and arrhythmia were excluded from CHD.
- A standardized test of intelligence (Wechsler Intelligence Scale for Children, 3rd edition, Japanese version, WISC-III) performed at 6 years old was useful to evaluate intellectual function.
- These data were compared between the CHD and no-CHD groups.

Results
- There were 456 VLBWI admitted in our NICU during the study period. All VLBWI underwent echocardiography. Of 456 VLBWI, CHD was detected in 27 VLBWI (Figure 1).

![Figure 1. Flow diagram of study patients](image)

- Total of 389 pts (18 in the CHD group and 371 pts in the no-CHD group) were alive at the time of assessment (at 6 years old). The mortality was higher in the CHD group than in the no-CHD group (34% in the CHD group vs. 14% in the no CHD group, p<0.05).

- The incidence of chromosomal anomalies was higher in the CHD (30%) than that in the no-CHD group (2%).

- Of 18 pts with CHD alive at the time of assessment, 3 pts were lost, 7 pts were withdrawn from the test owing to chromosomal anomaly, cerebral palsy, or other reasons. Thus, 8 pts were assessed by the WISK-III. Of 369 pts without CHD, 84 pts were lost, 49 pts were withdrawn owing to the same reasons in the CHD group. A total of 238 pts were assessed by the WISK-III in the no-CHD group. The percentage of withdrawal was higher in the CHD than that in the no-CHD group (33% in the CHD vs. 13% in the no-CHD group) (Figure 1).

![Figure 2. Surviving patients diagnosed with CHD at the time of assessment of 6 years old.](image)

- Diagnoses of CHD in the study group (n=8) are shown in Figure 2.
- Of 8 pts with CHD, 4 pts (50%) had surgery and others had medical therapy only.

- The gestational age, birth weight, Apgar score, period of stay in NICU, period of intubation were similar between the 2 groups (Table 1).

Table 1. Demographic and medical variables in the CHD and no-CHD group

<table>
<thead>
<tr>
<th></th>
<th>CHD group (n=8)</th>
<th>no-CHD group (n=238)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational weeks (wks)</td>
<td>31.0 (26-36)</td>
<td>29.0 (22-37)</td>
<td>0.26</td>
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<tr>
<td>Birth weight (g)</td>
<td>1074 (870-1472)</td>
<td>1093 (848-1496)</td>
<td>0.70</td>
</tr>
<tr>
<td>Apgar score at 5 minutes</td>
<td>8 (2-10)</td>
<td>8 (1-10)</td>
<td>0.84</td>
</tr>
<tr>
<td>Intubation period (day)</td>
<td>4 (0-45)</td>
<td>3 (0-372)</td>
<td>0.72</td>
</tr>
<tr>
<td>Hospitalization period (day)</td>
<td>84 (64-122)</td>
<td>76 (32-366)</td>
<td>0.13</td>
</tr>
</tbody>
</table>

- Full Scale IQ in prematurely born school-aged children (IQ=92.7, n=238) was slightly lower than published data in healthy normal children.
- There was no significant difference in Full Scale IQ, verbal IQ and performance IQ between the CHD and no-CHD group (Figure 4).

Figure 3. Flow diagram of study patients

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- Of 18 pts with CHD alive at the time of assessment, 3 pts were lost, 7 pts were withdrawn from the test owing to chromosome anomaly, cerebral palsy, or other reasons. Thus, 8 pts were assessed by the WISK-III. Of 369 pts without CHD, 84 pts were lost, 49 pts were withdrawn owing to the same reasons in the CHD group. A total of 238 pts were assessed by the WISK-III in the no-CHD group. The percentage of withdrawal was higher in the CHD than that in the no-CHD group (33% in the CHD vs. 13% in the no-CHD group) (Figure 1).

- No differences were found in verbal comprehension, perceptual organization, freedom from distractibility and processing speed score between the 2 groups (Figure 5).

Figure 4. Box plot group differences on Full Scale IQ, verbal and performance IQ.

Conclusions
- CHD is associated with increased mortality in the VLBWI infants.
- The incidence of chromosomal anomalies which may affect survival and cause development delay is high in the VLBWI infants with CHD.
- Although there are several limitations of the study, such as the retrospective nature, small number and type in the CHD group, similar intelligence capacity to prematurely born school-aged children without CHD may be expected when VLBWI infants with CHD have no chromosomal anomalies or cerebral palsy.