The correlation between the increase in insulin-like growth factor-I 24 hours after the first injection of growth hormone and the improved growth

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Introduction
Insulin-like growth factor-I (IGF-I) is a biomarker of growth hormone (GH), and is often used to titrate the dose of GH therapy. However, IGF-I production is regulated by not only GH but also other factors. We investigated whether the increase in IGF-I at several time points after the commencement of GH therapy could be a predictive factor for the improved growth.

Subjects and Methods
We studied 45 pre-pubertal patients with growth hormone deficiency (GHD) that had continued with GH treatment for more than 2 years (29 boys and 16 girls). GHD was mild in 20 patients, moderate in 18, and severe in seven.

We statistically analyzed the correlation between the following values:
1) The increase in IGF-I (ΔIGF-I) at 24 hours, 4 months, 1 year, or 2 years after GH therapy was started.
2) The increase in height SDS score (ΔHSDS) at 1 year or 2 years.

Table 1. Patients characteristics (n=45)

<table>
<thead>
<tr>
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<th>Mild (n=20)</th>
<th>Moderate (n=18)</th>
<th>Severe (n=7)</th>
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<tr>
<td>Age at the commencement of GH therapy</td>
<td>7.4 ± 1.5</td>
<td>7.3 ± 1.3</td>
<td>5.8 ± 2.0</td>
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<td>HSDS at the commencement of GH therapy</td>
<td>(5.5~11.3)</td>
<td>(5.5~9.8)</td>
<td>(3.1~6.1)</td>
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Results
The ΔIGF-I 24 hours after GH therapy was started was significantly correlated with ΔHSDS at 2 years in mild and moderate GHD patients (Figs 2A and 2B; p=0.021, r=0.511 and p=0.008, r=0.602, respectively). The ΔIGF-I at 4 months, 1 year, or 2 years in the mild and moderate GHD patients and at any time points in the severe GHD patients was not correlated with ΔHSDS at 2 years. When we analyzed both mild and moderate GHD patients together, the 24 hours ΔIGF-I was significantly correlated with ΔHSDS at 1 year as well (p=0.016, r=0.389, data not shown).

Discussion
This study clarified that the ΔIGF-I 24 hours after the initiation of GH therapy was significantly correlated with the improved growth of GHD patients. Since IGF-I is affected by various factors, i.e. nutrition and pubertal stage, its value immediately after the initiation of GH therapy is important to reflect the efficacy of GH.

Conclusion
IGF-I 24 hours after the first injection of GH is an early and useful predictive factor for the efficacy of GH in GHD patients.

References

Figures:
- Fig 1A. Mild GHD (ΔHSDS after 1 year of treatment)
- Fig 1B. Moderate GHD (ΔHSDS after 1 year of treatment)
- Fig 1C. Severe GHD (ΔHSDS after 1 year of treatment)
- Fig 2A. Mild GHD (ΔHSDS after 2 years of treatment)
- Fig 2B. Moderate GHD (ΔHSDS after 2 years of treatment)
- Fig 2C. Severe GHD (ΔHSDS after 2 years of treatment)