

The clinical significance of post-sleep growth hormone levels in the diagnosis of growth hormone deficiency

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Background

The growth hormone (GH) stimulation test, which requires multiple blood sampling, should be performed to confirm the diagnosis of GH deficiency (GHD) because of its pulsatile secretion. In addition to pharmacologic secretagogues such as insulin, L-dopa and arginine, deep sleep is also known as an important stimulator of GH secretion. The aim of this study was to assess the accuracy and predictive value of nocturnal GH level in the diagnosis of GHD, compared with standard GH stimulation tests.

Methods

One hundred cases of GH stimulation test were analyzed. GH stimulation was performed using two secretagogues among insulin, arginine, and L-dopa. All individuals had short stature below the 3rd percentile, and insulin-like growth factor (IGF)-1, IGF-BP3, peak GH levels at GH stimulation test, and nocturnal GH (post-sleep 1 hour) levels were measured. The difference between GHD (n=63) and non-GHD (n=37) group was analyzed.

Results

Table 1. Clinical and biochemical parameters of 100 patients with growth hormone stimulation test.

Variables	GHD (N=63)	Non-GHD (N=37)	P value
Male (%)	33 (52.3 %)	16 (43.2 %)	
CA (year)	7.35 ± 2.99	7.72 ± 3.16	0.561
BA (year)	5.71 ± 3.10	6.18 ± 3.27	0.480
Height SDS	-2.63 ± 0.51	-2.66 ± 0.47	0.809
BMI SDS	-0.32 ± 1.24	-0.76 ± 0.64	0.021
IGF-1 (ng/mL)	144.27 ± 63.57	152.05 ± 83.96	0.628
IGF-1 SDS	-0.78 ± 0.59	-0.87 ± 0.40	0.321
Post-sleep GH (ng/mL)	5.00 ± 3.63	10.48 ± 6.72	<0.001
GH peak (ng/mL)	6.25 ± 2.33	15.18 ± 7.43	<0.001

Table 2. Correlation analysis of factors on peak growth hormone levels

Variables	R	P value
CA (year)	-0.067	0.510
BA (year)	-0.064	0.524
Height (cm)	-0.082	0.418
Height SDS	-0.092	0.362
BMI (kg/m ²)	-0.285	0.004
BMI SDS	-0.255	0.010
IGF-1 (ng/mL)	-0.036	0.724
IGF-1 SDS	-0.172	0.087
Post-sleep GH (ng/mL)	0.473	<0.001

Table 3. The accuracy of post-sleep GH in the diagnosis of GHD

Post-sleep GH level (ng/mL)	Sensitivity	Specificity	Youden index
5	57.1 %	81.1 %	0.382
6	61.9 %	73.0 %	0.349
7	71.4 %	70.3 %	0.417
8	76.2 %	59.5 %	0.356
9	81.0 %	51.4 %	0.323
10	87.3 %	43.2 %	0.305
11	92.1 %	35.1 %	0.272

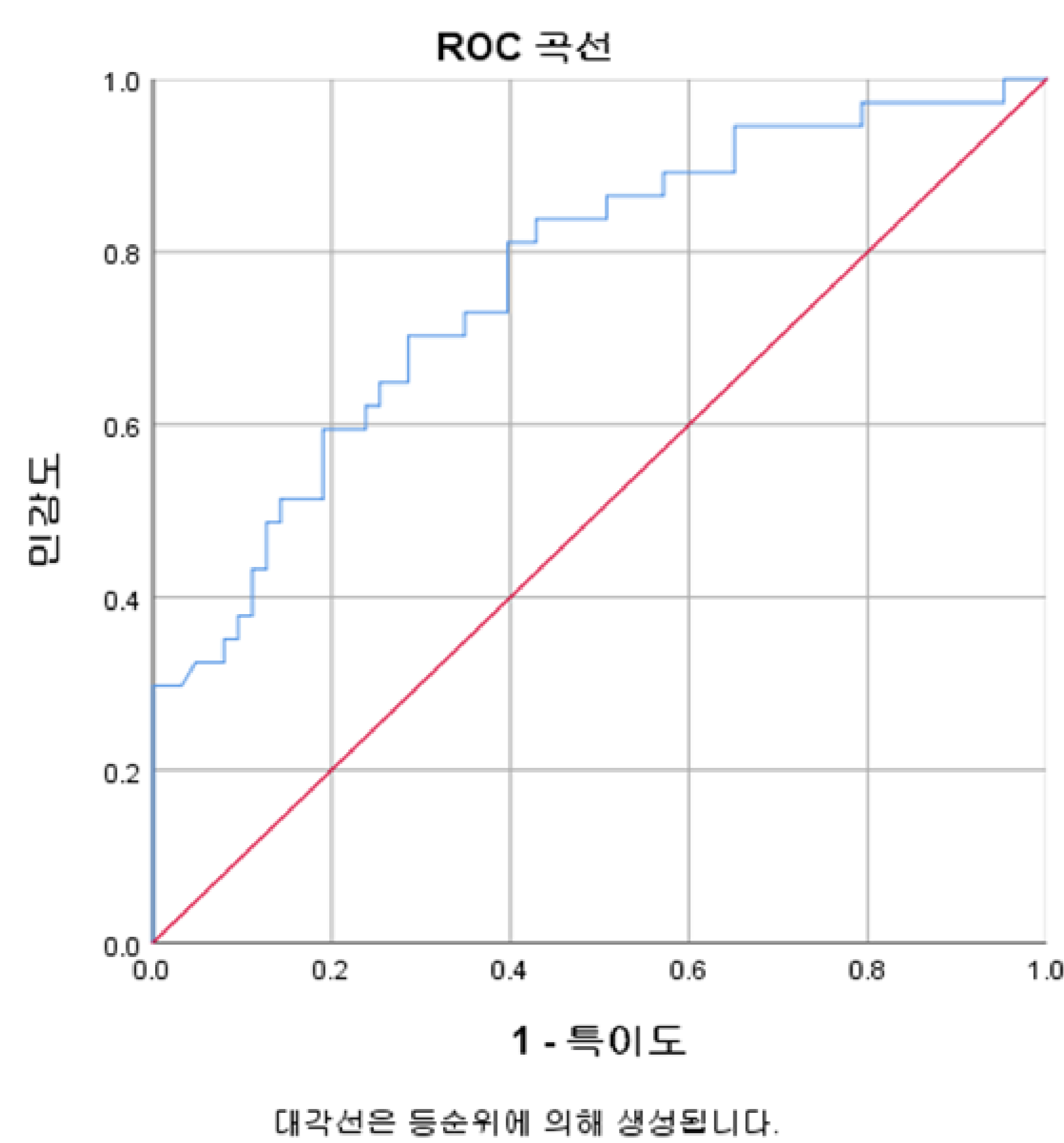


Figure 1. ROC curve of post-sleep GH level for prediction of GHD.

Table 4. The sensitivity, specificity, positive predictive value, negative predictive value of GH stimulation tests using each secretagogues and post

	Sensitivity	Specificity	PPV	NPV
Arginine	100 %	63.6 %	86.2 %	100 %
Dopamine	100 %	67.6 %	84 %	100 %
Insulin	100 %	50 %	73.3 %	100 %
Glucagon	100 %	100 %	100 %	100 %
Post-sleep GH (7 ng/mL)	71.4%	70.3 %	80.4 %	59.1 %

PPV, positive predictive value; NPV, negative predictive value

Summary

- Post-sleep GH level was significantly different between GHD and non-GHD group.
- Post-sleep GH level was positively correlated with GH peak.
- Glucagon stimulation test showed the highest sensitivity, specificity, PPV, NPV among GH stimulation tests.
- Post-sleep GH level below 7 ng/mL predicted GHD with the sensitivity of 71.4 % and specificity of 70.3 %

Conclusion

- Post-sleep GH can be used as an additive tool in the diagnosis of GHD.
- Further investigation is required on the diagnostic criteria of GHD and predictors of response to GH treatment.