

# Glucagon Testing of Childhood-Onset Growth Hormone Deficiency during Transition

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## INTRODUCTION

Childhood-onset Growth Hormone Deficiency (CO-GHD) is a rare disease whose aetiology is multifaceted. GH stimulation tests are well-studied and validated in childhood. After final height achievement, it is pivotal to clarify if GHD persists during the transition age in order to maintain or stop GHD therapy; Insulin Tolerance Test (ITT) and GHRH+arginine however are the only validated GH stimulation tests that might be contraindicated or not indicated in some circumstances.

## AIM

1. To reassess GH status by ITT and Glucagon tests (GL) in young adults with CO-GHD.
2. To validate the GL test during the transition age
3. To evaluate the influence of BMI on GH secretion after GL.

## METHOD

### Subjects:

n=70 CO-GHD subjects (26F, 44M) divided in 3 groups based on GHD severity<sup>1</sup>:

- 1) n=36 Idiopathic GHD (I-GHD)
- 2) n=18 Organic GHD with 0, 1 or 2 hormonal defects apart from GH (O-GHD)
- 3) n=16 Congenital/genetic defects/organic GHD with ≥3 hormone deficiencies apart from GH (CGO-GHD)

### GH stimulation tests

- ITT: insulin e.v. 0,1 UI/kg; glycemia and GH dosages at time points: -30', 0', 15', 30', 45', 60', 90', 120'.

Persistent GHD was defined as a GH peak < 6 mcg/L

- GL test: glucagon e.v. 30 mcg/kg; glycemia and GH dosages every 30' from T0' to T180'

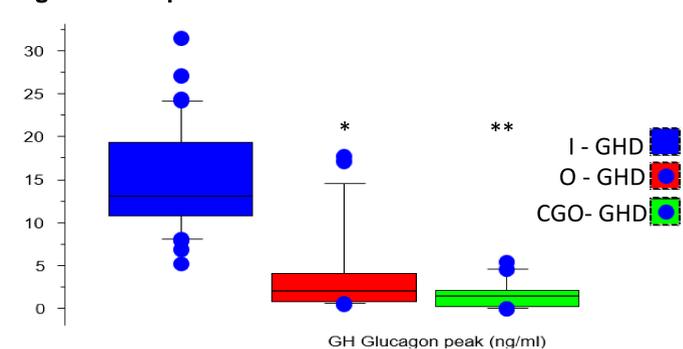
## RESULTS

Table 1. Anthropometric and biochemical parameters

	I-GHD (n=36)	O-GHD (n=18)	CGO-GHD (n=16)
	Mean; IQR		
GH peak, mcg/L (ITT) * **	18,6; 12,1 – 22,6	3,7; 0,1 – 6,5	1,7; 0,4 – 2,8
GH peak, mcg/L (GL) * **	15,0; 10,7 – 19,5	4,2; 0,7 – 4,2	1,7; 0,3 – 2,1
IGF-1 SDS * **	0,0; -0,7 – 0,9	-2,0; -2,7 – -0,5	-3,2; -4,7 – -1,5
BMI SDS * **	0,0; -0,7 – 0,7	1,1; 0,3 – 1,8	1,2; 0,4 – 2,3

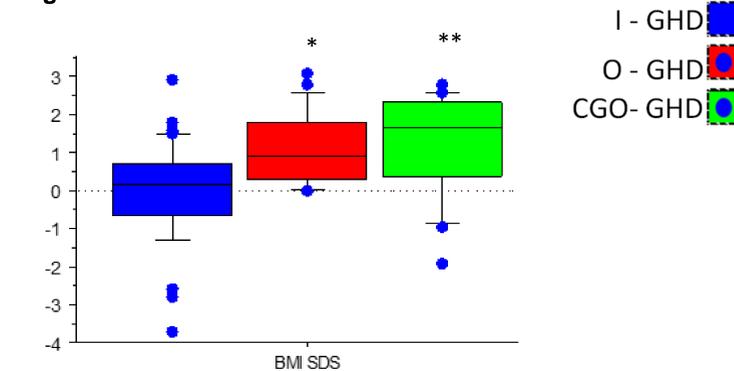
\*P < 0,001 between I-GHD and O-GHD \*\* P < 0,001 between I-GHD and CGO-GHD

Figure 1. GH peak after GL



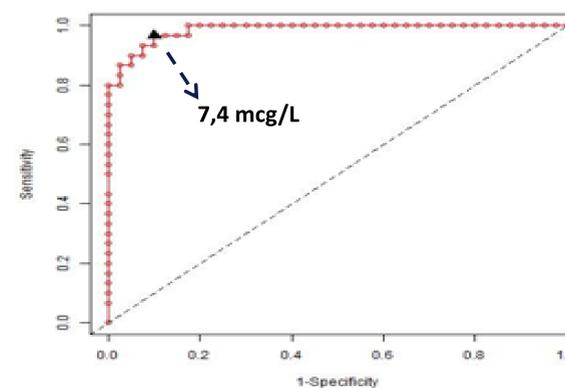
\*P < 0,001 between I-GHD and O-GHD ; P < 0,001 between I-GHD and CGO-GHD

Figure 2. BMI SDS



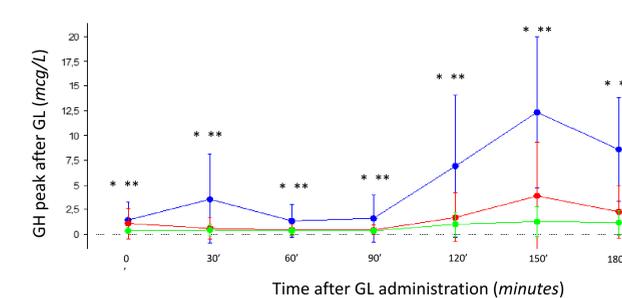
P < 0,001 between I-GHD and O-GHD ; P < 0,001 between I-GHD and CGO-GHD

Figure 3. ROC curve analyses for evaluate the best GH cut-off to GL



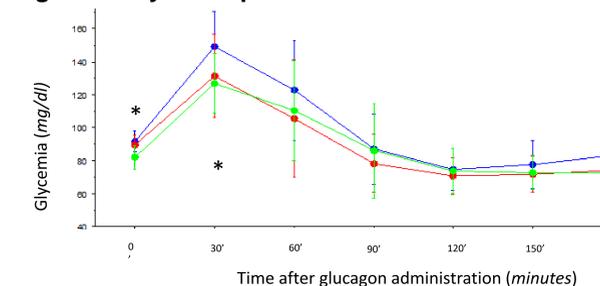
Sensitivity: 96.7%; Specificity: 90.0%; AUC: 0.938

Figure 4. GH concentration pattern after GL administration



\*P < 0,05 between I-GHD and O-GHD;  
\*\*P < 0,05 between I-GHD and CGO-GHD

Figure 5. Glycemic pattern after GL administration



\*P < 0,05 between I-GHD and CGO-GHD

Table 2. Correlations between GH peak to GL, GH peak to ITT, IGF-1 and BMI

	Total r; P	I-GHD r; P	O-GHD r; P	CGO-GHD r; P
GH peak to ITT	0,758; P<0,0001	0,49; P=0,002	0,46; P=0,05	0,81; P<0,0001
IGF-1 SDS	0,575; P<0,0001	0,07; P=ns	0,39; P=ns	0,30; P=ns
BMI SDS	-0,398; P=0,006	0,10; P=ns	-0,34; P=ns	-0,20; P=ns

## CONCLUSIONS

- The Glucagon test is accurate in detecting permanent GHD during transition with a cut-off value for GH peak of 7,4 µg/L.
- GH secretion remained significantly lower in CGO-GHD and O-GHD compared to I-GHD at all time points of the GL test.
  - Glycemic values differed only at baseline, T30 and T180 discriminating between I-GHD and CGO-GHD.
- GH peak after GL seems inversely related to BMI SDS, in particular in groups with permanent GHD (CGO-GHD and O-GHD)

## REFERENCES

1 Hoffmann et al. American association of clinical endocrinologists and american college of endocrinology guidelines for management of growth hormone deficiency in adults and patients transitioning from pediatric to adult care. *Endocr Pract.* 2019 Nov;25(11):1191-1232

## CONTACT INFORMATION

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