

## Glucagon Stimulation Test (Adults) - Full Clinical Guideline

Reference No: CHISCG38

### Glucagon Stimulation Test for the Assessment of Growth Hormone and ACTH/Cortisol Reserve in Adults

**THIS TEST IS ONLY TO BE PERFORMED FOLLOWING DISCUSSION WITH A CONSULTANT BIOCHEMIST OR ENDOCRINOLOGIST**

#### 1. Introduction

This test can be used to assess the pituitary/adrenal axis (Growth Hormone and ACTH/Cortisol) and is used when induction of hypoglycaemia using the insulin tolerance test is contra-indicated. Glucagon stimulates the release of GH and ACTH from the pituitary.

#### 2. Guideline

##### INDICATIONS

The assessment of ACTH/cortisol and GH reserve

##### CONTRAINDICATIONS

- Prolonged fast (48 hours or more)
- Severe cortisol deficiency (i.e. 9am cortisol <100 nmol/L) unless taking hydrocortisone and therefore to check GH reserve only
- Hyperinsulinism
- Pheochromocytoma (as glucagon may also stimulate the release of catecholamines)

##### SIDE EFFECTS

Nausea is common (about 30%) and vomiting

##### PRECAUTIONS

Serum free T4 should be normal (T4 deficiency may reduce the GH and cortisol response)

##### PREPARATION

###### Patient

The patient should be fasting from midnight but may drink water. The patient does not need to be continuously observed as hypoglycaemia is not provoked.

If testing the GH axis only (i.e. in patients with known adrenal insufficiency), **do not** omit the hydrocortisone dose. If the patient is taking glucocorticoids for another indication other than previously confirmed cortisol deficient state, the last dose should be at midday the day before the test.

###### Equipment

- Glucagon 1mg (or 1.5mg if patient >90kg)
- Indwelling cannula
- Blood collection tubes: 5 SST (yellow top) tubes, 5 fluoride oxalate (grey top) tubes

## PROCEDURE

The patient should be fasted, except for water, from midnight.

1. Insert indwelling cannula into patient and allow patient bed rest for 30 min before taking first sample.
2. Take basal samples for glucose (Grey top), GH and Cortisol (Yellow top).
3. Give the Glucagon intra-muscularly (the deltoid may be a suitable site).
4. Proceed with sampling as shown in the following table, clearly labelling each sample with the time point (eg '90 min').
5. After collecting the last sample, all the samples can be sent together to the Chemical Pathology laboratory using a separate request form for each.

TIME	BLOOD SAMPLES (All time points)
Insert the venous cannula and allow patient to rest for 30 minutes before taking the first blood sample.	
0 minutes	8 mL blood: 6mL in yellow top tube for GH and Cortisol 2mL in grey top tube for Glucose
<b>Give Glucagon i.m. (Dose = 1mg or 1.5mg if patient &gt;90kg)</b>	
90 minutes	8 mL blood: 6mL in yellow top tube for GH and Cortisol 2mL in grey top tube for Glucose
120 minutes	8 mL blood: 6mL in yellow top tube for GH and Cortisol 2mL in grey top tube for Glucose
150 minutes	8 mL blood: 6mL in yellow top tube for GH and Cortisol 2mL in grey top tube for Glucose
180 minutes	8 mL blood: 6mL in yellow top tube for GH and Cortisol 2mL in grey top tube for Glucose

## INTERPRETATION

### Growth Hormone Assessment

In a normal response Growth Hormone rises to above 13 micrograms/L (equivocal response is 6.5-13 micrograms/L) but this is very different from the definition of severe growth hormone deficiency used by NICE to define the patient group requiring treatment.

In order to receive NHS funded Growth Hormone therapy patients must have severe growth hormone deficiency defined as;

- Known hypothalamic pituitary abnormality
- Known deficiency of at least one other pituitary hormone
- AGHDA questionnaire score of at least 11 despite adequate replacement of all other hormone deficiencies
- Peak growth hormone of less than 3 µg/L on insulin tolerance test (or equivalent other test if contraindicated)

Reassessment of AGDHA after 9 months of appropriately titrated growth hormone therapy should show an improvement of 7 marks in order for treatment to continue.

### **Cortisol Assessment**

A normal response is defined as a 30 minute serum cortisol concentration greater than 420 nmol/L.

Untreated hypothyroidism can give subnormal results.

### **TURNAROUND TIME**

Cortisol results will normally be available within two working days following the test.

### **3. References**

Trainer PJ, Besser M. The Bart's Endocrine Protocols. Churchill Livingstone (Edinburgh), 1995: 6-8.

#### 4. Documentation Controls

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