

Department:	Biochemistry		
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Document title:	Endocrine Dynamic Function Test Protocols - Adults		

Glucagon Stimulation Test

Glucagon increases blood glucose which causes insulin release and indirectly stimulates GH and ACTH release through provocation of the hypothalamic-pituitary axis.

Indications

Assessment of growth hormone and ACTH/cortisol reserve especially when insulin-induced hypoglycaemia is contra-indicated.

Contraindications

- Pheochromocytoma or insulinoma (may provoke an attack)
- Starvation >48 hours or glycogen storage diseases (inability to mobilise glycogen may result in hypoglycaemia)
- Severe hypocortisolaemia (09:00 cortisol <100 nmol/L)
- Thyroxine deficiency may reduce GH and cortisol response
- This test is unreliable in patients with Diabetes Mellitus

Side Effects

Glucagon may cause nausea, vomiting and abdominal pain

Requirements

- 6 yellow top fluoride EDTA tubes
- 6 brown top serum tubes

Procedure

PATIENT PREPARATION

- Systemic steroids prednisolone and dexamethasone should be stopped 24 hours before the test
- If patient is taking hydrocortisone the morning dose should be omitted
- For non-urgent cases, oral oestrogens (combined OCP and HRT) should be stopped for 6 weeks prior to the test, (transdermal oestrogens can be continued)
- Patient should fast from midnight (water permitted) and be recumbent during the test.
- Perform a 9 am serum cortisol. Result should be reviewed by a doctor. If the patient is hypoadrenal for any reason (9am cortisol <100nmol/L) the case must be discussed with senior medical staff before administering glucagon
- Calculate glucagon dose: adults: 1 mg, (1.5mg if >90kg)

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TEST

Minutes	Procedure	Samples
-30	Insert an indwelling cannula	
0	Take basal samples for glucose, cortisol and GH	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
0	Give the glucagon im	
90	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
120	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
150	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
180	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
210	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)
240	Take samples for glucose, cortisol and GH.	1 x brown top serum (GH and cortisol) 1 x yellow top fluoride EDTA (glucose)

Interpretation of results

Normal response

Cortisol Peak: >430nmol/L

Growth Hormone Peak: >6.7 µg/L.

Glucose Should show a transient fall followed by a rise.

The European and Endo Society guidelines and NICE define severe GHD as GH <3 µg/L and partial <5 µg/L

SENSITIVITY AND SPECIFICITY

This is a less reliable test of somatotroph and corticotroph function than the ITT. It is an excellent alternative in patients who can not tolerate hypoglycaemia because of epilepsy, ischaemic heart disease or hypopituitarism. The false negative rate for cortisol response is 30%. with a sensitivity of 71% and a specificity of 57% for adequate cortisol reserve if a peak cortisol cut-off of >350 nmol/L is used. Only 4-8 % of normals will not show an adequate rise in GH: this is usually in patients over 50.

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