

Combined Test of Anterior Pituitary Function - Glucagon, TRH & GnRH

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Principles

- Simultaneous administration of GH stimulants and hypothalamic releasing hormones GnRH and TRH does not alter the hormonal response from that seen during a specific single provocation test.
- When multiple pituitary hormone deficiencies are suspected, it is practical and economical to carry out as many combined tests as possible.

Indication

Investigation of known / suspected multiple pituitary hormone disease

Precautions

- ! The GnRH test cannot be performed if the child has been primed with sex steroid to stimulate GH response
- ! The test should not be performed on a patient with pheochromocytoma or insulinoma as it may provoke an attack.
- ! The test should not be carried out following starvation of >48 hours or in the presence of a glycogen storage disease. The inability to mobilise glycogen may result in hypoglycaemia.
- ! The test should not be carried out in patients with severe hypocortisolaemia (9.00am level <100 nmol/L)
- ! Thyroid function must be normal as thyroxine deficiency may reduce the GH and cortisol response.

Side Effects

- Glucagon can cause nausea and abdominal pain (30%) and patients may rarely vomit.
- In children with suspected hypopituitarism prolonged fasting may induce hypoglycaemia. Blood glucose should be checked in these patients whenever a sample is taken.
- Asthmatic patients should be carefully monitored
- TRH administration can give patients the desire to urinate. It is therefore advisable to ask older children to empty their bladder before commencing the test.

Preparation

Patients should have only water for 8 hours prior to the test.

Protocol

Children can become hypoglycaemic after glucagon administration, usually 90 – 120 minutes post dose. Children <8 years of age are at particular risk.

- ! **Check glucose levels (by glucose meter) at the time of every sample.**
- ! **Check that the child is responsive at the time of every sample. If they do not respond, follow instructions for the emergency management of hypoglycaemia.**

Time (mins)	Medication to be administered	Samples to be taken				
-30				Cap. blood glucose	Cortisol	Growth Hormone
0		TSH, fT4, prolactin	LH, FSH Oestradiol (for girls) Testosterone (for boys)	Cap. blood glucose	Cortisol	Growth Hormone
0	1. Glucagon 2. TRH 3. GnRH (Gonadorelin)					
20		TSH, fT4, prolactin	LH, FSH			
30				Cap. blood glucose	Cortisol	Growth Hormone
60		TSH, fT4, prolactin	LH, FSH	Cap. blood glucose	Cortisol	Growth Hormone
90				Cap. blood glucose	Cortisol	Growth Hormone
120				Cap. blood glucose	Cortisol	Growth Hormone
150				Cap. blood glucose	Cortisol	Growth Hormone
180				Cap. blood glucose	Cortisol	Growth Hormone

1. Insert a 22G blue cannula and take -30 minute samples for capillary blood glucose, cortisol and growth hormone.
2. Wait 30 minutes before taking the baseline (t=0) sample for cortisol, growth hormone, cap. blood glucose, TSH, free T4, prolactin, LH, FSH, and oestradiol for girls, or testosterone for boys.

NB. If glucose < 2.6 mmol/L at the start of the test DO NOT PROCEED WITH TEST & DO NOT ADMINISTER GLUCAGON

Discuss with endocrine team. It may be necessary to administer 10% glucose 2 ml/kg throughout the test. Take a sample for glucose and growth hormone before administering glucose.

- If glucose level >2.6 mmol/L then administer **glucagon, TRH, and Gonadorelin**

Doses

Glucagon	Thyrotrophin Releasing Hormone	Gonadotrophin Releasing Hormone (Gonadorelin)
<p>Dose: 100 microgram/kg (maximum 1mg) IM</p> <p>See glucagon stimulation test protocol for post-test monitoring steroid procedure.</p>	<p>Dose: 5 micrograms/kg (maximum 200 micrograms) injected slowly IV over 2 min.</p>	<p>Dose: 2.5 micrograms/kg (max 100 micrograms) IV</p>

- Take blood samples at +20 mins for TSH, free T4, prolactin, LH, and FSH
- Take blood samples at +30 mins for blood glucose, cortisol, and GH
- Take blood samples at +60 mins for cortisol, growth hormone, cap. blood glucose, TSH, free T4, prolactin, LH, and FSH
- Take blood samples at +90, +120, +150 and + 180 mins for blood glucose, cortisol, and GH.
- Remember to check the child's glucose level by meter and the responsiveness at every sample, and record in patient notes.
- A sweet drink and a full meal must be eaten and tolerated after the test and the child should be observed for 1 hour after the test. Blood glucose (by meter) must be >4 mmol/L before discharge.

Samples

Hormones 2 mL (minimum) clotted blood (yellow/orange top)

Record actual sample collection times on the bottle labels.

SEND ALL SAMPLES TO THE LABORATORY TOGETHER

Only one clotted blood is required for each of the times except for the baseline samples and at 60 min when 2 samples are required.

It is, however, essential that each sample has a full 2 mL to ensure that there is sufficient blood volume for all tests.

Interpretation

As for individual stimulation tests.

References

- Brooks C., Clayton P. & Brown R. (2005) Brook's clinical paediatric endocrinology, 5th edition. Blackwell publishing, Oxford.