Corticotrophin Releasing Hormone (CRH) Test

Indication

CRH (Corticotrophin Releasing hormone) is given to test the responsiveness of the pituitary in producing ACTH and then cortisol. Generally patients with pituitary ACTH deficiency have a decreased ACTH and cortisol response to CRH. Patients with hypothalamic disorders however have an exaggerated and prolonged plasma ACTH response and a subnormal cortisol response. This test is sometimes useful as a means of discriminating pituitary from ectopic ACTH dependent Cushing’s syndrome.

Side effects

CRH may cause flushing of face, neck and upper body, hypotension, mild sensation of taste or smell

Precautions

Imipramine may reduce the ACTH response

Preparation

Fasting at least 6 hours. The test should be performed in the morning at 0900 hours. The patient should remain supine throughout the test. If the patient is to also have a high dose dexamethasone suppression test, the CRH test should be performed first.

Requirements

- Corticorelin (CRH)
- 8 EDTA and plain tubes

Blood at each time point for cortisol, and EDTA tube for ACTH (must be spun and frozen within 15 min) at each time point.

Procedure

Drug administration: Give CRH 1 microgram/kg (max 100 microgram) IV over one minute. Collect blood for ACTH and cortisol at –15, 0, 15, 30, 45, 60, 90 and 120 min after dose.

<table>
<thead>
<tr>
<th>time</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>-15mins</td>
<td>take 3ml blood for ACTH and cortisol</td>
</tr>
<tr>
<td>0 mins</td>
<td>take 3ml blood for ACTH and cortisol followed by intravenous CRH over 60 seconds</td>
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<tr>
<td>15 min</td>
<td>3ml blood for ACTH and cortisol</td>
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<tr>
<td>30 min</td>
<td>3ml blood for ACTH and cortisol</td>
</tr>
<tr>
<td>45 min</td>
<td>3ml blood for ACTH and cortisol</td>
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<tr>
<td>60 min</td>
<td>3ml blood for ACTH and cortisol</td>
</tr>
<tr>
<td>90 min</td>
<td>3ml blood for ACTH and cortisol</td>
</tr>
<tr>
<td>120 min</td>
<td>3ml blood for ACTH and cortisol</td>
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</tbody>
</table>
Interpretation Of Results:

**Normal Response:** ACTH peaks rapidly (within 15-30 minutes) while cortisol peaks around 30-60 minutes post-administration. ACTH rises less than 35% and cortisol rises to 430 – 820

**Cushing Disease:** CRH administration results in an excessive rise in plasma ACTH and serum cortisol in patients with pituitary Cushing’s disease, whilst this is rarely seen in patients with ectopic ACTH secretion. The CRH test has been reported to show a high sensitivity in diagnosis of Cushing’s disease in pre-pubertal children.

Normal or exaggerated response (10-15% may not respond) - ACTH increases by >35%. A peak increment of serum cortisol >20% and plasma ACTH >50% suggests Cushing’s disease. The CRH test has a sensitivity of 86-93% and a specificity of 90-100% using these cut off values to discriminate Cushing’s disease from ectopic ACTH secretion. A rise in ACTH by 35% at 15 and 30 min compared to basal levels also suggests a pituitary source.

CRH is also used to aid bilateral petrosal sinus sampling. The diagnostic sensitivity of basal central/peripheral ACTH ratio >2 and >3 post CRH is 94%.

**Ectopic ACTH:** ACTH high but no response to CRH (tumour does not have CRH receptors). An exaggerated response is seen in primary & secondary gonadal failure.

**ACTH deficiency:** Increased and prolonged ACTH response with subnormal cortisol response suggests hypothalamic CRH deficiency. Decreased ACTH and cortisol response to CRH suggests pituitary ACTH deficiency.

References

Adapted from Brook & Hindmarsh: Clinical Pediatric Endocrinology

Nieman LK, Lacroix A, Martin KA. Corticotrophin-releasing hormone stimulation test. UpToDate April 2012