**Gonadotrophin-releasing hormone (GnRH) test**

**ICE test name:** Child GnRH Stimulation (base)

**Principle**
Gonadotrophin-releasing hormone (GnRH), secreted by the hypothalamus, stimulates the release of luteinising hormone (LH) and follicle-stimulating hormone (FSH) from the anterior pituitary gland.

**Indication**
- Investigation of pubertal disorders: precocious puberty and delayed puberty.
- Investigation of hypogonadotrophic hypogonadism suspected pre-pubertally.

**Precautions**
- Avoid HCG injections prior to the test and do not perform following priming for an arginine test.

**Side Effects**
- GnRH may rarely cause nausea, headache and abdominal pain.

**Preparation**
The patient need not be fasted (unless combined with a test of GH secretion).

**Protocol**
1. Insert a reliable cannula. Take blood for LH, FSH, testosterone or oestradiol (t = 0).
2. Give a bolus dose of GnRH i.v. 2.5 micrograms/kg for children < 1 yr
   100 micrograms for children > 1 yr
3. Take blood at + 30 min
   + 60 min
   after the GnRH bolus for LH & FSH only

**Samples**
- LH & FSH 1 mL lithium heparin (orange top)
- Testosterone or Oestradiol 2 mL clotted blood (white top)

**Interpretation**
The GnRH test should be interpreted in the clinical context (including pubertal staging, testicular volume/ovarian ultrasound) and along with other biochemical markers of puberty such as serum oestradiol or testosterone levels.

**Prepubertal**
Basal LH usually <1 IU/L. LH peak post-GnRH <5 IU/L. FSH peak greater than LH peak.

**Peripubertal**
Higher increments, especially if LH dominant, provide evidence of a pubertal pattern of gonadotrophin response. LH peak >5 IU/L, with LH peak greater than FSH peak.

See Table 1 on the following page for the reference ranges from Resende et al. 2007, for serum LH and FSH concentrations (AutoDELFIA assays) in normal subjects at different pubertal stages (n=316 for basal levels, n=106 for GnRH stimulated levels).

**Pubertal Delay and Pubertal failure**
In children with suspected hypogonadotrophic hypogonadism, a complete lack of response supports the diagnosis. A measurable but low response has limited predictive value (may also occur in constitutional delay of puberty). In primary gonadal failure, the basal LH and FSH are elevated and the response to GnRH is exaggerated. High basal FSH levels in the presence of low oestradiol levels may suggest ovarian failure.
Premature thelarche and thelarche variant
There may be a FSH predominant response, with LH usually in the pre-pubertal range.

Precocious puberty
In gonadotrophin-independent precocious puberty, spontaneous gonadotrophin secretion is suppressed by the autonomous sex steroid secretion: basal LH and FSH are low and the response to GnRH is flat.

In gonadotrophin-dependent precocious puberty basal LH and FSH levels are usually elevated and the response to GnRH is exaggerated. A LH dominant rise is usually observed, with LH levels usually >7 IU/L and more commonly >10 IU/L in established puberty.

Precocious puberty (treated)
Suppressed basal LH and FSH and flat response to GnRH indicate adequate treatment with GnRH analogues.

Table 1 - Concentration of serum LH and FSH (AutoDELFIA assays), expressed as mean and 5th and 95th percentiles, in normal subjects at different pubertal stages (n=316 for basal levels, n=106 for GnRH stimulated levels)

<table>
<thead>
<tr>
<th>Pubertal Stage</th>
<th>Males</th>
<th>Females</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Basal</td>
<td>GnRH-stimulated peak</td>
</tr>
<tr>
<td></td>
<td>LH (IU/L)</td>
<td>FSH (IU/L)</td>
</tr>
<tr>
<td>T1&lt;2.6 yr</td>
<td>&lt;0.6</td>
<td>1.0 (1.0-1.4)</td>
</tr>
<tr>
<td>T1&lt;2.6 yr</td>
<td>&lt;0.6</td>
<td>1.1 (1.1-1.6)</td>
</tr>
<tr>
<td>T2I</td>
<td>1.3 (0.6-2.7)</td>
<td>1.8 (1.0-4.3)</td>
</tr>
<tr>
<td>T2I</td>
<td>1.4 (0.6-2.5)</td>
<td>2.1 (1.0-5.5)</td>
</tr>
<tr>
<td>T2I</td>
<td>1.6 (0.7-2.5)</td>
<td>2.1 (1.0-5.2)</td>
</tr>
<tr>
<td>T2I</td>
<td>4.7 (2.4-8.2)</td>
<td>3.2 (1.2-5.7)</td>
</tr>
</tbody>
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References