HYPERGONADOTROPISM

The condition of elevated concentrations of gonadotropins within the blood.

Diagnosis  Female

Related Diagnoses:
Premature ovarian failure

About Hypergonadotropism

Hypergonadotropism refers to the state of hormonal imbalance characterized by elevated concentrations of gonadotropins (pituitary hormones influencing the function of gonads) circulating in blood. This state appears as a compensatory reaction to the lack of sex hormones (e.g. oestrogen) caused by malfunction of sex gonads. It may also appear due to pituitary disorder or production of defective enzymes participating in the gonadal biosynthesis of sex hormones.

The gonadotropins include two hormones produced by anterior pituitary:

- **Follicle-stimulating hormone (FSH)** stimulates the production and maturation of sex cells, or gametes, including ova in women and sperm in men. FSH also promotes follicular growth; these follicles then release oestrogens in the female ovaries.
- **Luteinizing hormone (LH)** triggers ovulation in women, as well as the production of oestrogens and progesterone by the ovaries. In men, LH stimulates production of testosterone by the testes.

Both hormones are a part of so called hypothalamic-pituitary-gonadal axis (the hormonal cascade between hypothalamus, pituitary and gonads) and are subjected to the negative feedback (a hormone “X” production is decreased under the influence of hormone which produces). This means that the hormones produced by sex glands in response to LH and FSH stimulation, decrease the secretion of GnRH (gonadotropin releasing hormone) by hypothalamus resulting in lower production of gonadotropins (LH, FSH). Therefore, reduced function of gonads results in increased production of LH and FSH by pituitary.

Depending on the gland which gives rise to hypergonadotropism it can be divide into two subcategories, the primary and secondary hypergonadotropism.

**Primary hypergonadotropism** or hypergonadotropic hypogonadism is referring to the condition when the elevated gonadotropin levels are caused by functional impairment of sex glands. Primary hypergonadotropism often goes in hand with syndromes such as Swyer syndrome, Turner syndrome (45X,0), Klinefelter syndrome (47XXY) or XXXY syndrome. Listed syndromes are often connected with hormonal insensitivity (defective hormone receptors) of sex gland. Hypergonadotropism may also be a result of acquired pathology such as varicocele in case of men or mumps, the viral disease affecting both genders. The function of sex glands may be also impaired by an intoxication by specific chemical substances, such as endocrine disruptors. If the origin of hypergonadotropism is not connected with malfunction of sex gland, then the condition may be referred to as **secondary hypergonadotropism**. Secondary hypergonadotropism may appear due to the presence of a tumour in the hypothalamic area among other causes.

Hypergonadotropism physiologically appears as a part of some biological processes related to specific periods of ontogenesis (the development of an individual). Elevated FSH and LH levels in males are present during the puberty resulting in sexual maturation. Hypergonadotropism is naturally present in women during menopausal period. Menopause is characterized by decrease in function of ovaries which leads to reduced sex hormone production. As explained above, this result in increased FSH and LH production due to weakened hormonal negative feedback.
The diagnosis of hyperthyroidism is based upon blood analysis focused on gonadotropin concentrations. If too high FSH and LH concentrations are revealed, consequential treatment is focused on restoring the hormonal balance within the body with sex hormones (testosterone/oestrogen) employing the negative feedback of those to gonadotropins.

**Associated diseases**
- premature ovarian failure (POF)/premature ovarian insufficiency (POI)/primary ovarian insufficiency
- Swyer syndrome
- Turner syndrome
- Klinefelter syndrome
- mumps
- varicocele
- adrenal lipoplasia
- ovarian resistance syndrome
- azoospermia

**Complications**
- infertility
- increased risk of testicular tumour
- sex gland hypertrophy
- amenorrhea (absence of menstrual period during reproductive age)
- delayed puberty
- cerebellar ataxia (disorder in movement coordination originated within the cerebrum)

**Risk factors**
- infections of reproductive apparatus
- genetic predispositions
- endocrine disruptors intake
- radiation
- surgery
- drug abuse

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**Impact on fertility**

In women, hypergonadotropism and related hormonal imbalances or alterations in the “feedback mechanism” can prevent ovulation or cause it to be irregular. Specifically, the increased FSH production is caused by insufficient inhibin B (a hormone produced within the ovaries in response to gonadotropins) production which characteristic decreased ovary function. The scale of impaired ovary function is equivalent to the scale of fertility potential. The overproduction of gonadotropins has the same affect to healthy ovaries as underproduction, leading to disturbances in follicular development and thus, to reduced fertility.

Hypergonadotropism in men is impaired testicle function. As the spermatogenesis (the development of sperm cell) is hormone-dependent process, the alterations of hormonal balance result in lowered sperm production or even the stoppage of spermatogenesis. In case of primary hypergonadotropism, elevated gonadotropin levels appear due to impaired reaction of testicles to FSH and LH stimulation. This result in lack of sex hormones (testosterone) necessary for production of sperm. Elevated FSH and LH levels also negatively affects healthy testicles. Testosterone overproduction and high FSH values increases the rate of sperm production at the cost of reduced sperm quality.

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**Prevention**

With the respect to the risk factors, it is obvious, that healthy lifestyle may prevent the development of acquired hypergonadotropism. In case of syndrome-related hypergonadotropism there's no prevention available as the
problem is based upon congenital (genetic) disorder.

**Symptoms**

Elevated FSH and LH concentrations may manifest by amenorrhea, delayed puberty, reduced libido and fertility.

**Therapies**

**Self therapy**

None verified.

**Conventional medicine**

**Pharmacotherapy**

**Hormonal replacement therapy (HRT)**

Hormonal replacement therapy (HRT) is common way to treat hypergonadotropism. The administration of oestrogen in women and androgens in men results in lowered FSH and LH concentrations respectively. GnRH agonist may suppress the amount of naturally produced GnRH affecting pituitary which produces less gonadotropins afterwards. In case of adrenal dysfunction, corticosteroid administration may serve to compensate the production of defective steroids participating in hormonal biosynthesis.

**Surgical therapy**

As it is an endocrine problem, there's no surgical solution to primary hypergonadotropism. In case of secondary hypergonadotropism caused by tumour, the surgical removal of affected tissue is a standard procedure.

**Assisted reproduction**

Assisted reproductive techniques (ART) are an important tool for achieving pregnancy in couples where one of the partners (or both) are suffering from primary hypergonadotropism. Even in case of secondary hypergonadotropism and its succesfull treatment it may be difficult to achieve pregnancy. In case of primary hypergonadotropism caused by genetic predisposition, the use of donated oocytes/sperm is usually the only option how to achieve pregnancy. In case of successful treatment of acquired (non-congenital) hypergonadotropism in vitro fertilization (IVF) or intracytoplasmic sperm injection can be considered depending on severity of gonadal function impairment. IVF generally start with stimulating the ovaries to increase egg production. After stimulation, the surgical collection of one or more eggs from the ovary, and unites them with sperm in a laboratory setting, with the intent of producing one or more embryos. In case of males, the healthy sperm cell count in semen may be still low after the treatment, so the testicular sperm extraction (TESE) is used to retrieve healthy sperm cells directly from testicle. TESE is a form of surgical sperm retrieval to enable intracytoplasmic sperm injection (ICSI) to take place. The ICSI procedure involves a single sperm carefully injected into the centre of an egg using a microneedle.

**Find more about related issues**
**Diagnoses**

**Premature ovarian failure**
The loss of function of the ovaries before age 40.
Learn more at: [www.fertilitypedia.org/therapy/diag/premature-ovarian-failure](http://www.fertilitypedia.org/therapy/diag/premature-ovarian-failure)

**Therapies**

**Egg donation**
Process by which a woman donates eggs for purposes of assisted reproduction or biomedical research.
Learn more at: [www.fertilitypedia.org/edu/therapies/egg-donation](http://www.fertilitypedia.org/edu/therapies/egg-donation)

**ICSI**
A micromanipulative fertilization technique in which a single sperm is injected directly into an egg.
Learn more at: [www.fertilitypedia.org/edu/therapies/icsi](http://www.fertilitypedia.org/edu/therapies/icsi)

**Sperm donation**
The procedure in which a man (sperm donor) provides his sperm for fertility treatment.
Learn more at: [www.fertilitypedia.org/edu/therapies/sperm-donation](http://www.fertilitypedia.org/edu/therapies/sperm-donation)

**Standard IVF**
A process in which an egg is fertilised by sperm outside the body: in vitro. Own or donated gametes may be used.
Learn more at: [www.fertilitypedia.org/edu/therapies/standard-ivf](http://www.fertilitypedia.org/edu/therapies/standard-ivf)

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