UNDESCENDED TESTES

Testicular Cryptorchidism, Cryptorchism, Cryptorchidism, Retained Testis, Unilateral Cryptorchidism, Bilateral Cryptorchidism

In the case of cryptorchidism one or both testes are absent from the scrotum. It is is the most common etiologic factor of azoospermy in the adult.

Diagnosis Male

Related Diagnoses:
- Azoospermia
- Erectile dysfunction
- Klinefelter syndrome
- Kallmann syndrome
- Non-obstructive azoosperma
- Oligozoospermia
- Hypogonadism
- Sperm autoantibodies
- Testicular cancer
- Testicular torsion
- Idiopathic male infertility
- Hydrocele testis
- Swyer syndrome
- Gonadal dysgenesis
- Hypergonadotrophic hypogonadism

About Undescended testes

The term cryptorchidism is derived from the Greek words “kryptos” meaning “hidden” and “orchis” meaning testes.

Incomplete descent of one (unilateral) or both (bilateral) testicles from the abdominal cavity, through the inguinal canal into the scrotum is a multifactorial etiology abnormality that affects 1-1.8% of male infants. It is the most common genitourinary anomaly in male children. Its incidence can reach 3% in full term neonates, rising to 30% in premature boys. In unique cases, cryptorchidism can develop later in life, often as late as young adulthood.

In fact cryptorchidism has been proposed to be part of a "testicular dysgenesis syndrome" which includes hypospadias, reduced semen quality and testicular cancer. These conditions are thought to have a common origin in prenatal testicular maldevelopment, which affects both Leydig and Sertoli cells and germ cell differentiation. During development, the gonads are at first capable of becoming either ovaries or testes. In humans, starting at about week 4 the gonadal rudiments are present within the intermediate mesoderm adjacent to the developing kidneys. At about week 6, sex cords develop within the forming testes. These are made up of early Sertoli cells that surround and nurture the germ cells that migrate into the gonads shortly before sex determination begins. In males, the sex-specific gene SRY that is found on the Y-chromosome initiates sex determination by downstream regulation of sex-determining factors, which leads to development of the male phenotype, including directing development of the early bipotential gonad down the male path of development. Testes follow the "path of descent" from high in the posterior fetal abdomen to the inguinal ring and beyond to the inguinal canal and into the scrotum. In most cases (97% full-term, 70% preterm), both testes have descended by birth. In most other cases, only one testis fails to descend and that will probably express itself within a year. After six months of life therapeutic intervention is indicated, as a spontaneous descent is then unlikely.

A testis absent from the normal scrotal position can be found:
- along the "path of descent" from high in the posterior (retroperitoneal) abdomen, just below the kidney, to the inguinal ring
- in the inguinal canal
- ectopically, that is, to have "wandered" from that path, usually outside the inguinal canal and sometimes even under the skin of the thigh, the perineum, the opposite scrotum, or
the femoral canal
- undeveloped (hypoplastic) or severely abnormal (dysgenetic)
- to have vanished (anorchia)

In addition to quite common congenital forms, other – rare forms exist:
- **acquired undescended testis** - now a well-recognized disorder. It was suggested that acquired undescended testis is in fact congenital because of a short funiculus at birth, which allows scrotum to stay in a low position during early childhood. As boy grows, testis might get into undescended position. Usually it descends spontaneously, when testosterone levels rises significantly at puberty.
- **retractile testis** - can readily move or be moved between the scrotum and canal
- **gliding testes** - which can be manipulated into a satisfactory scrotal position but will retract quickly once released.

In relation to diagnosis, despite a sensitivity of 70-90% in the diagnosis of inguinal testes, ultrasonography is not useful in intra-abdominal cases. Although presenting a better quality, both computed tomography and nuclear magnetic resonance lack sufficient sensitivity and specificity to be considered as gold standard diagnostic tools. The treatment of the cryptorchid testicle(s) before 2 years of age is justified by the increased risk of infertility and malignancy, as well as an associated inguinal hernia and the risk of trauma to the ectopic testicle against the pubis. Furthermore, the psychological stigma of a missing testis for the patient, as well as the parents’ anxiety is also factors that justify this type of treatment.

**Associated diseases**

Undescended testes are associated with reduced fertility, high rate of anomalies of the epididymis, increased risk of testicular germ cell tumors, and psychological problems when the boy is grown. Undescended testes are also more susceptible to testicular torsion and infarction, and inguinal hernias. To reduce these risks, undescended testes are usually brought into the scrotum in infancy by a surgical procedure called an orchiopexy.

One of the strongest arguments for early orchiopexy is prevention of testicular cancer. About 1 in 500 men born with one or both testes undescended develop testicular cancer, roughly a 4 to 40 fold increased risk. The peak incidence occurs in the 3rd and 4th decades of life. The risk is higher for intra-abdominal testes and somewhat lower for inguinal testes. The most common type of testicular cancer occurring in undescended testes is seminoma (65%); in contrast, after orchiopexy, seminomas represent only 30% of testis tumors.

It is usually treatable if caught early, so urologists often recommend that boys who had orchiopexy as infants be taught testicular self-examination, to recognize testicular masses and seek early medical care for them. Cancer developing in an intra-abdominal testis would be unlikely to be recognized before considerable growth and spread, and one of the advantages of orchiopexy is that a mass developing in a scrotal testis is far easier to recognize than an intra-abdominal mass.

Cryptorchidism is also associated with some types of hypogonadotropic hypogonadism and gonadal dysgenesis caused by Swyer syndrome, Klinefelter syndrome and Kallmann syndrome.

**Complications**
- testicular cancer
- testicular torsion
- infertility
- inguinal hernia

**Risk factors**

Risk factors include premature birth, genetic predisposition, small-for-gestational-weight (SGA), birth weight < 2500 g as well as environmental factors (nicotine, alcohol, pesticides) and endocrine
disorders (e.g. disrupted hypothalamic-pituitary-gonad axis). 10% of the cases are bilateral and are commonly associated with complex syndromes or other congenital malformations such as abdominal wall defects or neural tube defects.

**Impact on fertility**

Many men who were born with undescended testes have reduced fertility, even after orchiopexy in infancy. The fertility reduction after orchiopexy for bilateral cryptorchidism is more marked, about 38%, or 6 times that of the general population.

At least one contributing mechanism for reduced spermatogenesis in cryptorchid testes is temperature. The temperature of testes in the scrotum is at least a couple of degrees cooler than in the abdomen and the temperature rising may damage fertility. Some circumstantial evidence suggests tight underwear and other practices that rise testicular temperature for prolonged periods can be associated with lower sperm counts. Nevertheless, research in recent decades suggests that the issue of fertility is more complex than a simple matter of temperature. It seems likely that subtle or transient hormone deficiencies or other factors that lead to lack of descent also impair the development of spermatogenic tissue.

**Prevention**

There is no way to prevent this condition because the exact cause is not known.

**Symptoms**

Usually, there are no symptoms other than the absence of the testicle in the scrotum (an empty scrotum.) In the minority of cases with bilaterally non-palpable testes, further testing to locate the testes, assess their function, and exclude additional problems is often useful. Pelvic ultrasound or magnetic resonance imaging performed and interpreted by a radiologist can often, but not invariably, locate the testes while confirming absence of a uterus. A karyotype can confirm or exclude forms of dysgenetic primary hypogonadism, such as Klinefelter syndrome or mixed gonadal dysgenesis. Hormone levels (especially gonadotropins and AMH) can help confirm that there are hormonally functional testes worth attempting to rescue, as can stimulation with a few injections of human chorionic gonadotropin to elicit a rise of the testosterone level. Occasionally these tests reveal an unsuspected and more complicated intersex condition.

**Therapies**

**Self therapy**

Non-existing.

**Conventional medicine**

Pharmacotherapy

**Hormones**
European Society of Paediatric Urologists (ESPU) is in favour of using gonadotrophin releasing hormone (GnRH) analogues to improve fertility in boys with undescended testis, particularly in those with bilateral disorders. Although the number of studies is limited and patient numbers are relatively low, GnRH analogues (in some studies used in combination with hCG) do appear to have a statistically significant beneficial effect on fertility indices both when used before orchidopexy and after. A series of human chorionic gonadotropin (hCG) injections (10 injections over 5 weeks is common) is given and the status of the testis/testes is reassessed at the end. Hormone treatment does have the occasional incidental benefits of allowing confirmation of Leydig cell responsiveness (proven by a rise of the testosterone by the end of the injections) or inducing additional growth of a small penis (via the testosterone rise, if the defect in the hypothalamic-pituitary-gonadal axis was present).

In the absence of testosterone generated by Leydig cells or in the case of non functional or absent androgen receptors, testicular descent is arrested at inguino-scrotal stage. In boys, testosterone replacement is initiated most frequently with testosterone enanthate 50 mg per month intramuscularly, with increasing dose every 6 months until 250 mg is given every 3 weeks in the third year. While testosterone treatment effectively induces virilisation including penile growth, pubic and male hair and beard growth, change of voice, libido, and pubertal growth spurt, testicular volume remains small, lacking spermatogenesis. LH stimulates intratesticular testosterone secretion by Leydig cells inhibiting Anti-Müller’s hormone production of the Sertoli cells, FSH induces testis growth via proliferation of seminiferous tubules, and both stimulate Inhibin B secretion by the Sertoli cells and sperm maturation.

Surgical therapy

Orchiopexy (or orchidopexy) is a surgery to move an undescended (cryptorchid) testicle into the scrotum and permanently fix it there. Orchiopexy typically also describes the surgery used to resolve testicular torsion. The undescended testicle may be located within the normal line of descent (for example, in the inguinal canal) or high in the scrotum or ectopically (i.e. the abdomen). During laparoscopy the surgeon uses an endoscope through the umbilicus to locate the testicle, and through other small opening(s) performs the procedure to complete the orchiopexy. The higher the testicle, the less successful the procedure. However, the procedure has a high success rate overall. In the open orchiopexy, if the testis isn’t found in the inguinal canal, a retroperitoneal and intraperitoneal exploration is carried out through the deep ring. In both approaches, the viable testis is brought down into the scrotum by mobilization of the spermatic pedicle; spermatic vessel ligation isn’t employed in any patient in this series. The finding of blind-ending vas and vessels indicated vanishing testis and further exploration is abandoned after removal of the nubbin of tissue at the termination of the vas and vessels. The considered atrophic testes are removed.

Assisted reproduction

The incidence of azoospermia in unilateral cryptorchidism is 13% and this figure increases to 89% in untreated bilateral cryptorchidism, making cryptorchidism the most common etiologic factor of azoospermia in the adult. A major advancement in recent years has been the introduction of IVF with ICSI which allows successful fertilization with the sperm obtained directly from testicular tissue. IVF-ICSI allows for pregnancy in couples where the man has irreversible testicular azoospermia as long as it is possible to recover sperm material from the testes. Pregnancies have been achieved in situations where azoospermia was associated with cryptorchism and sperm where obtained by testicular sperm extraction (TESE).
**Diagnoses**

**Azoospermia**
Complete absence of sperm in the ejaculate of a man.
Learn more at: [www.fertilitypedia.org/therapy/diag/azoospermia](http://www.fertilitypedia.org/therapy/diag/azoospermia)

**Erectile dysfunction**
The inability (that lasts more than 6 months) to develop or maintain an erection of the penis during sexual activity.
Learn more at: [www.fertilitypedia.org/therapy/diag/erectile-dysfunction](http://www.fertilitypedia.org/therapy/diag/erectile-dysfunction)

**Klinefelter syndrome**
The set of symptoms that result from two or more X chromosome in males.
Learn more at: [www.fertilitypedia.org/therapy/diag/klinefelter-syndrome](http://www.fertilitypedia.org/therapy/diag/klinefelter-syndrome)

**Kallmann syndrome**
A genetic condition where the primary symptom is a failure to start puberty or a failure to fully complete puberty.
Learn more at: [www.fertilitypedia.org/therapy/diag/kallmann-syndrome](http://www.fertilitypedia.org/therapy/diag/kallmann-syndrome)

**Non-obstructive azoospermia**
Complete absence of sperm in the ejaculate due to testicular failure.
Learn more at: [www.fertilitypedia.org/therapy/diag/non-obstructive-azoospermia](http://www.fertilitypedia.org/therapy/diag/non-obstructive-azoospermia)

**Oligozoospermia**
Semen with a low concentration of sperm and is a common finding in male infertility.
Learn more at: [www.fertilitypedia.org/therapy/diag/oligozoospermia](http://www.fertilitypedia.org/therapy/diag/oligozoospermia)

**Hypogonadism**
A medical term which describes a diminished functional activity of the gonads – the testes and ovaries.
Learn more at: [www.fertilitypedia.org/therapy/diag/hypogonadism](http://www.fertilitypedia.org/therapy/diag/hypogonadism)

**Sperm autoantibodies**
Antibodies that bind to sperm, inhibiting their movement, stopping recognition and entry into the egg.
Learn more at: [www.fertilitypedia.org/therapy/diag/sperm-autoantibodies](http://www.fertilitypedia.org/therapy/diag/sperm-autoantibodies)

**Testicular cancer**
Cancer that develops in the testicles.
Learn more at: [www.fertilitypedia.org/therapy/diag/testicular-cancer](http://www.fertilitypedia.org/therapy/diag/testicular-cancer)

**Testicular torsion**
Emergency medical condition occurring when the spermatic cord twists and cuts off the testicle's blood supply.
Learn more at: [www.fertilitypedia.org/therapy/diag/testicular-torsion](http://www.fertilitypedia.org/therapy/diag/testicular-torsion)

**Idiopathic male infertility**
A condition in which fertility impairment occurs spontaneously or due to an unknown cause.
Learn more at: [www.fertilitypedia.org/therapy/diag/idiopathic-male-infertility](http://www.fertilitypedia.org/therapy/diag/idiopathic-male-infertility)

**Hydrocele testis**
An accumulation of clear fluid in the tunica vaginalis, the most internal of membranes containing a testicle.
Learn more at: [www.fertilitypedia.org/therapy/diag/hydrocele-testis](http://www.fertilitypedia.org/therapy/diag/hydrocele-testis)
Swyer syndrome
A rare disorder characterized by a phenotypic female with an XY karyotype.
Learn more at: www.fertilitypedia.org/therapy/diag/swyer-syndrome

Gonadal dysgenesis
Any congenital developmental disorder of the reproductive system characterized by a progressive loss of germ cells on the developing gonads.
Learn more at: www.fertilitypedia.org/therapy/diag/gonadal-dysgenesis

Hypergonadotropic hypogonadism
Decreased functional activity of the gonads, with retardation sexual development, associated with high levels of hormones that stimulate the gonads.
Learn more at: www.fertilitypedia.org/therapy/diag/hypergonadotropic-hypogonadism

Organs

Epididymis
The epididymis is a tube that connects a testicle to a vas deferens in the male reproductive system.
Learn more at: www.fertilitypedia.org/edu/organs/epididymis

Hypothalamus
A region of the forebrain that regulates body temperature, some metabolic processes and governs the autonomic nervous system.
Learn more at: www.fertilitypedia.org/edu/organs/hypothalamus

Pituitary gland
An endocrine gland, about the size of a pea, whose secretions control the other endocrine glands and influence growth, metabolism, and maturation.
Learn more at: www.fertilitypedia.org/edu/organs/pituitary-gland

Scrotum
Scrotum is an anatomical male reproductive structure that consists of a suspended sack of skin and smooth dual-chamber muscle located under the penis.
Learn more at: www.fertilitypedia.org/edu/organs/scrotum

Seminiferous tubules
Tube structures within the testes where spermatogenesis occurs.
Learn more at: www.fertilitypedia.org/edu/organs/semiferous-tubules

Testes
Male gonads which produce both sperm and androgens, such as testosterone, and are active throughout the reproductive lifespan of the male.
Learn more at: www.fertilitypedia.org/edu/organs/testes

Reproductive cells

Leydig cell
The cell found in interstitial tissue of testicles responsible for production of androgens - male hormones.
Learn more at: www.fertilitypedia.org/edu/reproductive-cells/leydig-cell
**Sertoli cells**
The cell in seminiferous epithelium responsible for nutrition and development of germ (sperm) cells.
Learn more at: [www.fertilitypedia.org/edu/reproductive-cells/sertoli-cells](http://www.fertilitypedia.org/edu/reproductive-cells/sertoli-cells)

**Spermatogonium**
An undifferentiated male germ cell with self-renewing capacity representing the first stage of spermatogenesis.
Learn more at: [www.fertilitypedia.org/edu/reproductive-cells/spermatogonium](http://www.fertilitypedia.org/edu/reproductive-cells/spermatogonium)

---

**Biological control**

**Anti-Müllerian hormone**
A hormone, that provokes the regression of male fetal Müllerian ducts.
Learn more at: [www.fertilitypedia.org/edu/biological-control/anti-mullerian-hormone](http://www.fertilitypedia.org/edu/biological-control/anti-mullerian-hormone)

**Follicle-stimulating hormone**
FSH is a hormone secreted by the anterior pituitary gland. It regulates the development, growth, pubertal matur and reproductive functions of the body.
Learn more at: [www.fertilitypedia.org/edu/biological-control/follicle-stimulating-hormone](http://www.fertilitypedia.org/edu/biological-control/follicle-stimulating-hormone)

**Gonadotropin-releasing hormone**
A releasing hormone responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the anterior pituitary.
Learn more at: [www.fertilitypedia.org/edu/biological-control/gonadotropin-releasing-hormone](http://www.fertilitypedia.org/edu/biological-control/gonadotropin-releasing-hormone)

**Luteinizing hormone**
A hormone, that stimulates ovulation and the development of the corpus luteum in females, and the production of androgens in males.
Learn more at: [www.fertilitypedia.org/edu/biological-control/luteinizing-hormone](http://www.fertilitypedia.org/edu/biological-control/luteinizing-hormone)

**Progesterone**
Steroid hormone, secreted by the ovaries, whose function is to prepare the uterus for the implantation of a fertilized ovum and to maintain pregnancy.
Learn more at: [www.fertilitypedia.org/edu/biological-control/progesterone](http://www.fertilitypedia.org/edu/biological-control/progesterone)

**Testosterone**
Steroid hormone produced primarily in the testes of the male; responsible for the development of secondary sex characteristics in the male.
Learn more at: [www.fertilitypedia.org/edu/biological-control/testosterone](http://www.fertilitypedia.org/edu/biological-control/testosterone)

---

**Reproductive functions**

**Fertilization**
The fusion of an ovum with a sperm to initiate the development of a new individual organism.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/fertilization](http://www.fertilitypedia.org/edu/reproductive-functions/fertilization)

**Spermatogenesis**
Process in which spermatozoa are produced from male primordial germ cells in testicles by way of mitosis and meiosis.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/spermatogenesis](http://www.fertilitypedia.org/edu/reproductive-functions/spermatogenesis)

---

**Risk factors**
Inguinal hernia
A protrusion of abdominal-cavity contents through the inguinal canal.
Learn more at: www.fertilitypedia.org/therapy/inguinal-hernia

Prenatal testicular maldevelopment
A congenital condition characterized by the disruption of fetal testicular development.
Learn more at: www.fertilitypedia.org/therapy/prenatal-testicular-maldevelopment

Preterm birth
A birth of a baby at less than 37 weeks gestational age.
Learn more at: www.fertilitypedia.org/therapy/preterm-birth

Symptoms

Abnormal sperm morphology
A normal sperm morphology of less than 4% of sperms in an ejaculate.
Learn more at: www.fertilitypedia.org/edu/symptoms/abnormal-sperm-morphology

Absence of sperm in ejaculate
The medical condition of a man whose semen contains no sperm.
Learn more at: www.fertilitypedia.org/edu/symptoms/absence-of-sperm-in-ejaculate

Hypospadias
A birth defect of the urethra in the male where the urinary opening is not at the usual location on the head of the penis.
Learn more at: www.fertilitypedia.org/edu/symptoms/hypospadias

Immobile or dead spermatozoa in semen
A condition in which spermatozoa in semen are either immobile or dead.
Learn more at: www.fertilitypedia.org/edu/symptoms/immobile-or-dead-spermatozoa-in-semen

Infertility
The failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.
Learn more at: www.fertilitypedia.org/edu/symptoms/infertility

Low concentration of sperm
A condition refers to semen with a low concentration of sperm.
Learn more at: www.fertilitypedia.org/edu/symptoms/low-concentration-of-sperm

Low semen volume
A condition in which a man has an unusually low ejaculate (or semen) volume, less than 1.5 ml.
Learn more at: www.fertilitypedia.org/edu/symptoms/low-semen-volume

Reduced sperm motility
The decreased ability of sperm cell to move progressively.
Learn more at: www.fertilitypedia.org/edu/symptoms/reduced-sperm-motility

Small testes
Abnormally small testicular volume.
Learn more at: www.fertilitypedia.org/edu/symptoms/small-testes
**Ultrasound cryptorchidism**
Medical ultrasound image of cryptorchidism.

**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

**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

**Orchiopexy**
Surgery to move an undescended testicle into the scrotum used as a treatment of cryptorchidism.
Learn more at: www.fertilitypedia.org/edu/therapies/orchiopexy

**Preimplantation genetic screening**
The term PGS is used to denote procedures that do not look for a specific disease but to identify embryos at risk of de-novo occurring aneuploidies
Learn more at: www.fertilitypedia.org/edu/therapies/preimplantation-genetic-screening-1

**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

**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

**Inguinal canal**
Location of the Inguinal canal

**Undescended testes**
The absence of one or both testes from the scrotum.
Learn more at: www.fertilitypedia.org/edu/symptoms/undescended-testes
"Laparoscopic versus Open orchiopexy approach for the management of non-palpable undescended testis" —by El-labban licensed under CC BY-SA 4.0

"Germinal epithelium testicle" —by Uwe Gille licensed under CC BY-SA 3.0

"Cryptorchidism" —sourced from Wikipedia licensed under CC BY-SA 3.0

"Operative management of cryptorchidism: guidelines and reality - a 10-year observational analysis of 3587 cases" —by Hensel et al. licensed under CC BY 4.0

"Cryptorchidism" —sourced from Boundless licensed under CC BY 4.0

"Genetics of Isolated Hypogonadotropic Hypogonadism: Role of GnRH Receptor and Other Genes" —by Beate et al. licensed under CC BY 3.0

"Management of cryptorchidism: a survey of clinical practice in Italy" —by Marchetti et al. licensed under CC BY 2.0

"Study of Undescended Testes by High Frequency Ultrasound" —by Onkar et al. licensed under CC BY-NC 4.0

"Orchiopexy" —sourced from Wikipedia licensed under CC BY-SA 3.0

"Ultrasound image of cryptorchidism" —by Dilmen licensed under CC BY-SA 3.0

"Major Causes of Male Infertility" —sourced from Infertipedia licensed under CC BY-SA 3.0