OBSTRUCTIVE AZOOSPERMIA

Post Testicular Azoospermia, Excretory Azoospermia

Absence of sperm in the ejaculate despite normal spermatogenesis, caused by an obstruction of the genital tract.

Related Diagnoses:
- Azoospermia
- Anejaculation
- Ejaculatory disorders
- Retrograde ejaculation
- Non-obstructive azoospermia
- Asperma
- Hypospermia
- Teratospermia
- Epididymitis
- Congenital absence of the vas deferens
- Young's syndrome
- Abnormal semen pH
- Sinopulmonary infection

About Obstructive azoospermia

Obstructive azoospermia (OA) is a condition of complete absence of spermatozoa (sperm cells) in the semen, caused by inability of the sperm to reach the emitted semen (Pic. 1). This may be due to absence of the vasa deferentia (also called ductus deferens; these vasa transport sperm from the epididymis to the ejaculatory ducts in anticipation of ejaculation), obstruction of the vas deferens (vasal obstruction), epididymal obstruction, ejaculatory duct obstruction (EDO) or ejaculation disorders. The presence of no sperm in the semen renders the man incapable of conceiving a child naturally. Although certain cases of OA are treatable by surgery, most patients with OA will eventually require assisted reproductive techniques (ART) to conceive.

Azoospermia is defined as the complete absence of sperm from the ejaculate. This diagnosis must be confirmed by centrifugation of a semen specimen for 15 min at room temperature with high-powered microscopic examination. The complete absence of spermatozoa should be confirmed with repeat testing after a long time, because many external factors (e.g. febrile episodes and some therapies) may cause transient azoospermia. Azoospermia is present in
approximately 1% of all men, and in approximately 15% of infertile men. Azoospermia may result from a lack of spermatozoa production (spermatogenesis) in the testes (secretory or non-obstructive azoospermia), or from an inability of produced spermatozoa to reach the emitted semen (obstructive azoospermia); however, in clinical practice both components are sometimes present in a single patient (mixed genesis azoospermia).

To determine whether the azoospermia is of obstructive or non-obstructive nature, minimum initial evaluation of an azoospermic patient should include a complete medical history, physical examination, and hormone level measurements (Pic. 2). Physical examination includes: testis size and consistency; consistency of the epididymides; secondary sex characteristics; presence and consistency of the vasa deferentia; presence of a varicocele; and masses upon digital rectal examination. The initial hormonal evaluation should include measurement of serum testosterone (T) and follicle stimulating hormone (FSH) levels.

When the vasa deferentia and testes are palpably normal, semen volume and serum FSH are key factors in determining the etiology of azoospermia. Azoospermic patients with normal ejaculate volume may have reproductive system obstruction or spermatogenesis abnormalities. Azoospermic patients with low semen volume and normal-sized testes may have ejaculatory dysfunction or ejaculatory duct obstruction.

Normal semen volume

The serum FSH level of a patient with normal semen volume is a critical factor with which to establish whether a diagnostic testicular biopsy is needed to investigate spermatogenesis. Patients who have a normal serum FSH should undergo a diagnostic testicular biopsy, because normal or borderline elevated serum FSH levels may suggest either obstruction or abnormal spermatogenesis. If the testicular biopsy is normal, an obstruction in the reproductive system must be found. Most men with OA, palpable vasa deferentia, and no history of iatrogenic vasal injury present with bilateral epididymal obstruction. Epididymal obstruction can be identified only by surgical exploration. Vasography (imaging method for examining the patency of vas deferens) may be utilized to determine whether there is an obstruction in the vas deferens or ejaculatory duct.

Reduced semen volume

Low ejaculate volume (< 1.0 ml) that is not caused by hypogonadism (insufficient function of the testes) or CBAVD (congenital bilateral absence of the vas deferens) may be caused by ejaculatory dysfunction, but is most likely caused by EDO.

Ejaculatory dysfunction rarely causes low ejaculate volume with azoospermia. All patients presenting with absent ejaculation or low-volume ejaculation (<1.5
ml) should be asked to repeat the semen analysis and provide a post-ejaculation urine specimen.

Sperm present in the urine are typical for ejaculation disorders. Additional seminal parameters that may be helpful in determining the presence of EDO are seminal pH and fructose, since the seminal vesicle secretions are alkaline and contain fructose.

EDO is detected by transrectal ultrasonography (TRUS). The finding of dilated ED and/or dilated seminal vesicles on TRUS is suggestive (may be a sign of it), but not diagnostic, of EDO. Therefore, seminal vesicle aspiration (SVA) and seminal vesiculography (X-ray-based examination of the seminal vesicles) may be performed under TRUS guidance to make a more definitive diagnosis of EDO. EDO is detected by TRUS, and is usually accompanied by dilation of the seminal vesicles (typically >1.5 cm).

**The cause of obstructive azoospermia** can be generally divided into five categories: absence of vasa deferentia (Pic. 3), vasal obstruction, epididymal obstruction, ejaculatory duct obstruction and ejaculation disorders.

1. **Absence of vasa deferentia**

Congenital bilateral absence of the vas deferens (CBAVD) is found in 1% of infertile men and in up to 6% of those with obstructive azoospermia. It has two principal causes: cystic fibrosis, and abnormal embryonic development of the mesonephric duct, or Wolffian duct, from which the vas deferens develops.

Cystic fibrosis is a genetic disease caused by mutations in the CFTR gene. Eighty percent of men with CBAVD and 43% of men with a congenital unilateral absence of the vas deferens have detectable CFTR gene mutations.

The clinical features of CBAVD include normal testis size and preservation of spermatogenesis. The caput epididymis is always present, but the corpus and the cauda are found only occasionally. Seminal vesicles are often absent or atrophic but may also be enlarged or cystic. The ejaculate is acidic and low in volume [<1 ml].

Any insult to the Wolffian duct before week seven of gestation may impair urinary and reproductive tract formation including partial epididymal aplasia (missing epididymis, or a part of it), seminal vesicle aplasia (missing seminal vesicles) or hypoplasia (underdeveloped seminal vesicles) which may lead to a low ejaculate volume.

2. **Vasal obstruction**
The most common cause of obstruction of the vas deferens is vasectomy performed for elective sterilization. During this procedure, the vasa deferentia are surgically severed and then tied. The most frequent cause of nonpurposeful vasal obstruction is inadvertent injury during a variety of inguinal, scrotal, and pelvic surgeries, most commonly hernia repair. This complication more frequently occurs when performed in infancy but can occur after any inguinal procedure where the vas deferens and spermatic cord are manipulated. The diagnosis is suspected when examination reveals normal testicular size and the epididymis is full and firm.

3. Epidydimal obstruction

Causes of obstruction of the epididymis include Young’s syndrome and scarring caused by inflammation (epididymitis).

Young’s syndrome is a triad of disorders that encompasses chronic sinusitis (inflammation of the paranasal sinuses), bronchiectasis (pathologic dilation of the bronchi) and obstructive azoospermia. Patients with this syndrome have only mildly impaired respiratory function and normal spermatogenesis. The exact cause of azoospermia is not completely elucidated but is most likely due to obstruction of the epididymis by inspissated secretions. The sperm appear to be normal in patients with Young’s syndrome, and paternity has been documented in these patients.

Epididymitis (inflammation of the epididymis) is a common genitourinary condition, and an infectious etiology should always be considered in men with this diagnosis. If left untreated, epididymitis can cause an intense inflammatory reaction, leading to secondary scarring and obstruction of the epididymis.

4. Ejaculatory duct obstruction

Ejaculatory duct obstruction is a pathological condition characterized by the obstruction of one or both ejaculatory ducts and may be either congenital or acquired. Congenital causes include extrinsic compression of the ejaculatory ducts by various congenital cysts. Acquired causes may be secondary to trauma caused by surgery, calculi (stones) in the prostate or seminal vesicles or infection and scarring. Affected men usually have low semen volume with azoospermia, normal secondary sexual characteristics and normal hormonal levels. On ultrasound examination, seminal vesicles appear dilated.

5. Disorders of ejaculation
Ejaculatory dysfunction includes a variety of disorders. Ejaculatory dysfunction should be suspected in any patient with a low volume (<1.0 ml) of or absent ejaculate and should be distinguished from anorgasmia (the inability to reach an orgasm during sexual intercourse). Retrograde ejaculation can be defined as the abnormal backward flow of semen into the bladder with ejaculation. The diagnosis of retrograde ejaculation is made by examining the post-ejaculate urine for sperm. In contrast, sperm will not be present in the urine of a patient with failure of emission, which must be diagnosed clinically.

**Associated diseases**

**Cystic fibrosis**

CF is a systemic illness that affects multiple organ systems, including lungs, endocrine and epithelial tissues, gastrointestinal system, pancreas, and reproductive tract. Infertility in CF males has been extensively studied and found in most cases to be secondary to atrophy or malformation of the vas deferens, leading to an obstructive azoospermia. The defective CFTR ion channel function causes an early obstruction of male genital tract, due to the dehydrated secretions: this mechanism drives to deep structural changes in reproductive tract, causing in most cases a congenital bilateral absence of the vas deferens (CBAVD).

**Young's syndrome**

Young's syndrome is a rare disease that encompasses a combination of bronchiectasis, rhinosinusitis (the inflammation of the tissues of nasal cavity and paranasal sinuses) and reduced male fertility. The reduction in fertility is secondary to obstructive azoospermia. Sperm cells are produced normally in affected males, but do not reach the seminal fluid due to a physical obstruction of the genital tract. Sperm cells are found in the epididymis (the tubules leading out of the testis) in a viscous, lipid-rich fluid.

**Wolffian duct anomaly**

Unilateral absence or hypoplasia (underdevelopment) of the vas deferens is derived from failure of organogenesis of the Wolffian ducts system, and its association with renal agenesis (missing kidney) has been well described. Unilateral or bilateral vasal hypoplasia or unilateral absence of the vas may be an indicator of obstructive azoospermia, as a high percentage of these patients will have anomalies of the contralateral seminal vesicle. Partial vasal agenesis has also been described.
Epididymitis

Epididymitis is an inflammation of the epididymis, and is predominantly caused by bacterial infection. Gonorrhea, chlamydia, trichomonas, brucellosis, BCG, ureaplasma, mycoplasma, coliforms bacteria, adenovirus, and enterovirus have all been reported as causes of epididymitis. The inflammation may lead to production of fibrous scar tissue and obstruction of the epididymis, leading to obstructive azoospermia. Infection was the proposed etiology for obstructive azoospermia in 8-46% of patients undergoing vasal reconstruction.

Ejaculatory duct obstruction

Obstruction of the ejaculatory duct may be congenital or acquired. Congenital causes include extrinsic compression of the ejaculatory ducts by Müllerian (utricular) or Wolffian (diverticular) cysts. Acquired causes may be secondary to iatrogenic trauma (postsurgical), prostatic calcification, seminal vesicle calculi (stones) or infected-related scar tissue. Although there are no specific findings associated with ejaculatory duct obstruction, quite a few clinical findings are highly suggestive of this condition. Men with this condition present with low-volume azoospermia; dilated seminal vesicles; and normal secondary sex characteristics, testes size, and hormonal profiles. Based on a suspicious semen analysis results, a transrectal ultrasound may be performed to confirm the diagnosis. Ejaculatory duct obstruction must not be confused with an obstruction of the vas deferens; approximately 80% of the volume of the semen is the gel-like fluid originating from the seminal vesicles, whereas the fraction from the testicles and epididymis, which contain the spermatozoa, accounts for only 5 to 10% of the volume of the semen. Thus, vasal obstruction usually does not influence the ejaculate volume.

Retrograde ejaculation

Retrograde ejaculation refers to the propulsion of semen back into the urinary bladder rather than the usual antegrade flow. Normally the sphincter of the bladder contracts and the sperm goes to the urethra towards the area of least pressure. In retrograde ejaculation this sphincter does not function properly. Causes may be in the autonomic nervous system or the operation of the prostate. Retrograde ejaculation is a common side effect of medications that are used to relax the muscles of the urinary tract for various purposes. These medications may cause the bladder sphincter to relax as well and fail to contract fully. Retrograde ejaculation can also be a complication of diabetes especially in cases of diabetics with long term poor blood sugar control. This is due to neuropathy (damage to the nerves) of the bladder sphincter.

Complications
Infertility

Azoospermia is a common condition found in men seeking treatment for infertility. Obstructive azoospermia, however, is usually associated with normal spermatogenesis. Therefore, even in cases where the obstruction of the genital tract cannot be surgically corrected, the patient's own sperm cells may be used to achieve a pregnancy.

Risk factors

- chronic lung disease
- epididymitis
- surgery
- retrograde ejaculation
- vasectomy
- genetic disorders

Impact on fertility

Obstructive azoospermia is a common urologic condition and accounts for 6.1% to 13.6% of patients presenting for fertility evaluation. Despite being associated with infertility, azoospermia does not necessarily imply sterility. Men with obstructive azoospermia usually produce normal sperm cells in their testes. Although selected cases of OA may be surgically correctable, treatment options for most couples with azoospermia-related infertility will ultimately include assisted reproductive techniques, which is a broad term used to define any procedure that involves handling of both sperm and oocytes outside the body, such as in vitro fertilization (IVF) and its variant, intracytoplasmic sperm injection (ICSI). Assisted reproductive technologies are generally used when the specific cause of obstructive azoospermia cannot be surgically corrected, or the surgical treatment of the condition does not succeed in restoring the patient's fertility.

Prevention
Prevention of obstructive azoospermia is possible only in the case of acquired causes: these include iatrogenic damage due to surgery, post-infection scars and retrograde ejaculation. In the case of surgery, prevention is possible by careful manipulation of the vas deferens that doesn’t cause any inadvertent damage to it. In the case of epididymitis, proper treatment with antibiotics should be administered to reduce the risk of scar formation and epididymal obstruction. In the case of retrograde ejaculation, prevention options include avoiding drugs with known effect on the bladder sphincter and proper diabetes control.

Symptoms

Reduced volume of ejaculate

It occurs progressively in the post-inflammatory obstruction of the ejaculatory ducts (ED), with a concomitant reduction of seminal fructose and lowering of pH. Ejaculate volume is normally reduced in cases of vas deferens agenesis or in the presence of large seminal cysts (Müllerian or Wolffian). Partial retrograde ejaculation is present in patients with systemic neuropathy (e.g., juvenile diabetes and multiple sclerosis), and is a possible outcome of endoscopic urological surgery performed on the bladder neck.

Urological symptoms

Symptoms suggestive of an obstruction in the genital tract include episodes of hemospermia (blood in the semen), burning urination, urinary frequency, and a history of urethral catheterization after surgery. All of these symptoms should raise the suspicion that the proximal or distal seminal tract may be obstructed. The presence of hypospadias may be associated with urinary abnormalities and the presence of residues in the Müllerian duct of the prostate (utricular cysts). These cysts can be responsible for extrinsic compression of the ED.

Acidic pH of the semen

The balance between the alkaline secretion of the seminal vesicles and the acidic prostatic secretion determines the semen pH. When the ejaculatory duct is obstructed, the secretions of the seminal vesicles cannot reach the emitted semen. Therefore, its pH value will be lower than 7, indicating an acidic solution.
Therapies

Self therapy

There is currently no effective self-therapy method for obstructive azoospermia. Diet and lifestyle changes may be beneficial in patients with non-obstructive azoospermia, but in OA patients, either the obstruction of the genital tract has to be surgically removed, or assisted reproductive technology (ART) has to be used to achieve a pregnancy.

Conventional medicine

The aim of treating obstructive azoospermia is to restore the patency of the seminal tract and spontaneous fertility. Treatment choice depends on the localization and characteristics of the obstructing lesion. Pharmacotherapy with antibiotics is effective in treating infection of the genital tract, which would cause scarring and obstruction if left untreated. Surgery is indicated in the following cases:

- azoospermia confirmed by at least two recent seminal examinations
- preservation of spermatogenesis on at least one side
- absence of retrograde ejaculation
- absence of seminal tract infection

When it is not possible to restore the patency of the seminal tract, the next step is to proceed to surgical sperm recovery (to be used fresh or after cryopreservation for ART).

Pharmacotherapy

Epididymitis treatment

Antibiotics are used in the prevention of epididymal obstruction due to inflammation and scarring of the epididymis, caused by infection. The type of antibiotic is chosen based on the knowledge of the causative pathogen, the pharmacological aspects of the drug and the characteristics of the patient.

Surgical therapy
Vasoepididymostomy

Vasoepididymostomy (Pic. 4) is performed to treat congenital, infectious, post-vasectomy or idiopathic (without a known cause) obstruction of the epididymis. The rate of restoration of patency varies between 60% and 87%, and spontaneous pregnancies vary between 10% and 43%. Accuracy of microsurgical technique affects the outcome of reconstructive procedures on the male reproductive system. The best results are achieved by surgeons with training and ongoing experience in microsurgery. Before vasoepididymostomy, or when anastomosis (re-connecting two parts of the genital tract, e.g. epididymis and vas deferens, together) is not feasible, sperm aspiration (retrieval of sperm cells from the epididymis using suction) and cryopreservation (preservation of the sperm cells by cooling them to very low temperatures) should be performed for future use for ICSI, in case of failure of the anastomosis.

Vasovasostomy

The obstruction of the vas deferens that results from vasectomy can usually be successfully treated (Pic. 5). By contrast, in lesions of the distal vas deferens, usually resulting from bilateral (on both sides) hernia repair, the stumps of the vas deferens are often poorly identified in the context of scar tissue. It is therefore necessary to resort to a wide mobilization of the stumps to perform both proximal (the part closer to the abdomen) and distal (the part closer to the testicle) anastomosis. The outer diameter of the duct remains constant as a result of obstruction, while the inner testicular slope expands approximately 2-4 times. Factors that will influence the success of the anastomosis are:

- The use of a surgical microscope
- The quality of the tissues involved in the anastomosis
- The presence and characteristics of the fluid that is released from the proximal stump of the ductus
- Distal patency of the seminal vesicle
- The duration of obstruction

The recanalization rates vary between 86% and 93%, while the cumulative spontaneous pregnancy rates range between 52% and 82%. The duration of the obstruction appreciably affect the success rate of vasovasostomy.

Transurethral resection of the ejaculatory ducts (TURED)

Transurethral resection of the ejaculatory ducts (TURED) is proposed
for the resolution of EDO. The indications for TURED are represented by a complete or incomplete congenital or acquired obstruction of the distal seminal tract, caused by atresia (closure), strictures (narrowing), or scarring; or in the presence of gallstones of ED; or subsequent prostatic cysts, whether or not they communicate with the seminal tract.

**Assisted reproduction**

If conservative medical treatments fail to achieve a pregnancy, the physician may suggest the patient to use the methods of assisted reproduction. Assisted reproductive technology (ART) is the technology used to achieve pregnancy in procedures such as fertility medication, artificial insemination, in vitro fertilization and surrogacy. It is reproductive technology used primarily for infertility treatments, and is also known as fertility treatment. It mainly belongs to the field of reproductive endocrinology and infertility, and may also include intracytoplasmic sperm injection (ICSI) and cryopreservation. Some forms of ART are also used with regard to fertile couples for genetic reasons (preimplantation genetic diagnosis). ART is also used for couples who are discordant for certain communicable diseases; for example, HIV to reduce the risk of infection when a pregnancy is desired.

Intracytoplasmic sperm injection is beneficial in the case of male factor infertility where sperm counts are very low or failed fertilization occurred with previous IVF attempt(s). The ICSI procedure involves a single sperm carefully injected into the center of an egg using a microneedle. With ICSI, only one sperm per egg is needed. Without ICSI, you need between 50,000 and 100,000.

Two techniques that enable to some extent the selection of physiologically normal spermatozoa have recently been developed. One of these is termed intracytoplasmic morphology-selected sperm injection (IMSI). Here, spermatozoa are selected for ICSI and analysed digitally prior to the microinjection procedure in order to deselect morphologically abnormal spermatozoa. With this technique, abnormalities not visible in standard ICSI procedures have been observed. IMSI increases the pregnancy rate during ICSI cycles, and some data suggests that the level of pregnancy termination is also decreased. A second technique recently introduced to assisted reproduction is that of sperm selection with hyaluronic acid (HA), e.g. physiological intracytoplasmic sperm injection (PICSI). In this technique, mature sperm with HA receptors are distinguished from immature and abnormal sperm since these do not express such receptors.
To this end, several sperm retrieval methods have been developed to collect epididymal and testicular sperm to be used in conjunction with ART for men with azoospermia. Briefly, either percutaneous (PESA) or microsurgical epididymal sperm aspiration (MESA) are used to retrieve sperm from the epididymis in men with obstructive azoospermia, and testicular sperm aspiration (TESA) or testicular sperm extraction (TESE, Pic. 6) are used to retrieve sperm from the testes in men with OA who fail PESA. Alternatively, the retrieved sperm can be cryopreserved (stored using special freezing methods) for use in future sperm injection attempts.

If all efforts to extract vital sperm cells fails, then donated ones may be recommended.

Find more about related issues

Diagnoses

Azoospermia
Complete absence of sperm in the ejaculate of a man.
Learn more at: www.fertilitypedia.org/therapy/diag/azoospermia

Anejaculation
The pathological inability to ejaculate in males, with (orgasmic) or without (anorgasmic) orgasm.
Learn more at: www.fertilitypedia.org/therapy/diag/anejaculation

Ejaculatory disorders
A class of sexual disorders defined as the subjective lack of normal ejaculation.
Learn more at: www.fertilitypedia.org/therapy/diag/ejaculatory-disorders

Retrograde ejaculation
The semen, which would normally be ejaculated via the urethra, is redirected to the urinary bladder.
Learn more at: www.fertilitypedia.org/therapy/diag/retrograde-ejaculation

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
**Aspermia**
Male diagnosis connected with male infertility characterised by the complete absence of semen.
Learn more at: [www.fertilitypedia.org/therapy/diag/aspermia](http://www.fertilitypedia.org/therapy/diag/aspermia)

**Hypospermia**
A condition in which a man has an unusually low ejaculate (or semen) volume.
Learn more at: [www.fertilitypedia.org/therapy/diag/hypospermia](http://www.fertilitypedia.org/therapy/diag/hypospermia)

**Teratospermia**
Teratospermia is a condition characterized by the presence of sperm with abnormal morphology that affects fertility in males.
Learn more at: [www.fertilitypedia.org/therapy/diag/teratospermia](http://www.fertilitypedia.org/therapy/diag/teratospermia)

**Epididymitis**
An inflammation of epididymis.
Learn more at: [www.fertilitypedia.org/therapy/diag/epididymitis](http://www.fertilitypedia.org/therapy/diag/epididymitis)

**Congenital absence of the vas deferens**
A condition in which the vasa deferentia reproductive organs, fail to form properly prior to birth.
Learn more at: [www.fertilitypedia.org/therapy/diag/congenital-absence-of-the-vas-deferens](http://www.fertilitypedia.org/therapy/diag/congenital-absence-of-the-vas-deferens)

**Young's syndrome**
A rare condition causing chronic lung disease, rhinosinusitis and azoospermia.
Learn more at: [www.fertilitypedia.org/therapy/diag/young-s-syndrome](http://www.fertilitypedia.org/therapy/diag/young-s-syndrome)

**Abnormal semen pH**
A semen pH value outside of the normal range which is harmful to sperm and can cause infertility.
Learn more at: [www.fertilitypedia.org/therapy/diag/abnormal-semen-ph](http://www.fertilitypedia.org/therapy/diag/abnormal-semen-ph)

**Sinopulmonary infection**
An infection of the paranasal sinuses and/or the lungs, associated with several conditions of impaired fertility.
Learn more at: [www.fertilitypedia.org/therapy/diag/sinopulmonary-infection](http://www.fertilitypedia.org/therapy/diag/sinopulmonary-infection)
**Bulborethral gland**
Bulborethral gland is one of two small exocrine glands in the reproductive system of male. Learn more at: [www.fertilitypedia.org/edu/organs/bulborethral-gland](http://www.fertilitypedia.org/edu/organs/bulborethral-gland)

**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](http://www.fertilitypedia.org/edu/organs/epididymis)

**Penis**
External male sex organ that additionally serves as the urinal duct. Learn more at: [www.fertilitypedia.org/edu/organs/penis](http://www.fertilitypedia.org/edu/organs/penis)

**Prostate**
A walnut-sized structure that is located below the urinary bladder in front of the rectum. Learn more at: [www.fertilitypedia.org/edu/organs/prostate](http://www.fertilitypedia.org/edu/organs/prostate)

**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](http://www.fertilitypedia.org/edu/organs/scrotum)

**Seminal vesicles**
One of two simple tubular glands responsible for the production of about 60 percent of the fluid that ultimately becomes semen. Learn more at: [www.fertilitypedia.org/edu/organs/seminal-vesicles](http://www.fertilitypedia.org/edu/organs/seminal-vesicles)

**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](http://www.fertilitypedia.org/edu/organs/testes)

**Vas deferens**
The duct in the testicle that carries semen from the epididymis to the ejaculatory duct. Learn more at: [www.fertilitypedia.org/edu/organs/vas-deferens](http://www.fertilitypedia.org/edu/organs/vas-deferens)

**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](http://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)

**Sperm**
A male reproductive cell which is able to fertilize the counterpart female gamete - the oocyte.
Learn more at: [www.fertilitypedia.org/edu/reproductive-cells/sperm](http://www.fertilitypedia.org/edu/reproductive-cells/sperm)

**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)

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**Reproductive functions**

**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)

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**Risk factors**

**Groin surgery**
A surgery, which is performed in inguinal part of the body.
Learn more at: [www.fertilitypedia.org/therapy/RF/groin-surgery](http://www.fertilitypedia.org/therapy/RF/groin-surgery)

**Vasectomy**
A surgical procedure for male sterilization or permanent contraception.
Learn more at: [www.fertilitypedia.org/therapy/RF/vasectomy](http://www.fertilitypedia.org/therapy/RF/vasectomy)

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**Symptoms**
Abnormal semen pH
A pH value outside of the normal range which is harmful to sperm.
Learn more at: www.fertilitypedia.org/edu/symptoms/abnormal-semen-ph

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

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

Sexual frustration
A frustration caused by a discrepancy between a person's desired and achieved sexual activity.
Learn more at: www.fertilitypedia.org/edu/symptoms/sexual-frustration

Testicular pain
A discomfort felt in the testicles (testes) or scrotum.
Learn more at: www.fertilitypedia.org/edu/symptoms/testicular-pain

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

Laser-assisted immotile sperm selection
Method, which uses a laser to identify viable sperm cell, recommended in MESA/TESA IVF cycles or in patients diagnosed with sperm immotility.
Learn more at: www.fertilitypedia.org/edu/therapies/laser-assisted-immotile-sperm-selection-1

MESA
A microsurgical procedure to harvest sperm from the single epididymal tubule (epididymis), used in the case of obstructive azoospermia.
Learn more at: www.fertilitypedia.org/edu/therapies/mesa

Micro TESE
Microsurgical method used to identify areas of sperm production within the testes with the aid of optical magnification.
Learn more at: www.fertilitypedia.org/edu/therapies/micro-tese

PESA
Sperm aspiration procedure in which a needle is inserted into the epididymis in order to retrieve sperm.
Learn more at: www.fertilitypedia.org/edu/therapies/pesa

Preimplantation genetic diagnosis
Technology that allows couples with a family history of monogenic disorders, x-linked diseases and chromosomal abnormality have a healthy baby.
Learn more at: www.fertilitypedia.org/edu/therapies/preimplantation-genetic-diagnosis

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](http://www.fertilitypedia.org/edu/therapies/standard-ivf)

**TESE**
Removal of a small portion of testicular tissue in order to extract a few viable sperm. Learn more at: [www.fertilitypedia.org/edu/therapies/tese](http://www.fertilitypedia.org/edu/therapies/tese)

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**Gallery**

**Pic**
A diagram showing the differences between the obstructive and non-obstructive type of azoospermia.

**Pic**
The algorhytm for evaluating the cause of azoospermia.

**Pic**
An illustration of the male reproductive tract. The vas deferens carries the sperm from epididymis and joins with the duct of the seminal vesicles to form the ejaculatory duct.

**Structure of the Penis**
- Prostate gland
- Corpora cavernosa
- Corpus spongiosum
- Spongy urethra
- Membranous urethra
- Bulbourethral gland
- Bulbourethral gland
- Membranous urethra
- Urethral meatus
- External urethral orifice
- Glans penis
A photograph of the vasoepididymostomy surgery, with the vas deferens being reattached to the epididymis.

A photograph of the vasovasostomy surgery, where two parts of the vas deferens are attached together.

The illustration depicts TESE using a single open biopsy.

Sources

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