TESTICULAR CANCER

Testicular Tumor

Cancer that develops in the testicles.

Diagnosis ♂ Male

Related Diagnoses:

Undescended testes | Non-obstructive azoospermia | Hydrocele testis

About Testicular cancer

Testicular cancer is cancer that develops in the testicles, a part of the male reproductive system. Although testicular cancer can be derived from any cell type found in the testicles, more than 95% of testicular cancers are germ cell tumors. Most of the remaining 5% are sex cord-gonadal stromal tumors derived from Leydig cells or Sertoli cells. Over man’s lifetime, his risk of testicular cancer is roughly 1 in 250 (0.4%). It is the most common cancer in males aged 20–39 years, the period of peak incidence, and is rarely seen before the age of 15 years. Children born with an undescended testicle have an increased risk of getting testicular cancer regardless of whether surgery is done to correct the problem.

Testicular cancer has one of the highest cure rates of all cancers with an average five-year survival rate of 95%. If the cancer has not spread outside the testicle, the 5-year survival is 99% while if it has grown into nearby structures or has spread to nearby lymph nodes, the rate is 96% and if it has spread to organs or lymph nodes away from the testicles, the 5-year survival is around 74%. Even for the relatively few cases in which cancer has spread widely, chemotherapy offers a cure rate of at least 80%.

Treatment depends on the type of testicular tumor and stage of the tumor. To determine which type of tumor is it, it needs to be examined under microscope. Staging is used to distinguish if the cancer is only in testicles, or if it spreads to other parts of body:

- Stage I cancer has not spread beyond the testicle
- Stage II cancer has spread to lymph nodes in the abdomen
- Stage III cancer has spread beyond the lymph nodes (it could be as far as the liver, lungs, or brain)

Depending on the type and size of tumor different treatments can be used:

- In the case of both seminomas and nonseminomas, Testicle can be removed surgically (orchiectomy). Nearby lymph nodes are usually removed, too (lymphadenectomy).
- Radiation therapy which uses high-dose x-rays or other high-energy rays may be used after surgery to prevent the tumor from returning. This therapy is usually used for treating seminomas, because nonseminomas are resistant.
- Chemotherapy (using drugs to kill cancer cells) improves survival of patients with both seminomas and nonseminomas.
Two sets of tumors were defined depending on their ability to invade neighboring tissue or metastasize: malignant vs. benign tumors. Malignant tumors represents a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. On the other hand, benign tumors consist of a mass of cells that lacks the ability to invade neighboring tissue or metastasize. Malignants are - seminoma, embryonal carcinoma, trophoblastic tumor, carcinoid, granulosa cell tumor, yolk sac tumor, spermatocytic seminoma. Strictly benign are ganodoblastomas and thecoma, then there are tumors, that are mostly benign but some percent are malignant such as teratomas, Sertoli cell tumors and Leydig cell tumors.

1. Germ cell tumors

Seminomas

(also known as pure seminoma or classical seminoma) is a germ cell tumor of the testicle or, more rarely, the mediastinum or other extra-gonadal locations. It is a malignant neoplasm and is one of the most treatable and curable cancers, with a survival rate above 95% if discovered in early stages.

Testicular seminoma originates in the germinal epithelium of the seminiferous tubules. About half of germ cell tumors of the testicles are seminomas. Treatment usually requires removal of one testicle. However, fertility isn’t affected. All other sexual functions will remain intact.

Embryonal carcinomas

In the testis pure embryonal carcinoma is also uncommon, and accounts for approximately ten percent of testicular germ cell tumors. However, it is present as a component of almost ninety percent of mixed nonseminomatous germ cell tumors. The average age at diagnosis is 31 years, and typically presents as a testicular lump which may be painful. One fifth to two thirds of patients with tumors composed predominantly of embryonal carcinoma have metastases at diagnosis.

Teratomas

The tissues of a teratoma, although normal in themselves, may be quite different from surrounding tissues and may be highly disparate; teratomas have been reported to contain hair, teeth and bone. Because they are encapsulated, teratomas are usually benign, although several forms of malignant teratoma are known and some of these are common forms of teratoma. A mature teratoma is typically benign and found more commonly in women, while an immature teratoma is typically malignant and is more often found in men.

Yolk sac tumors

Endodermal sinus tumor (EST), also known as yolk sac tumor (YST), is a member of the germ cell tumor group of cancers. It is the most common testicular tumor in children under 3, and is also known as infantile embryonal carcinoma. This age group has a very good prognosis. In contrast to the pure form typical of infants, adult endodermal sinus tumors are often found in combination with other kinds of germ cell tumor, particularly teratoma and embryonal carcinoma. While pure teratoma is usually benign, endodermal sinus tumor is malignant.

Trophoblastic tumors

Choriocarcinoma is widely known as a malignant, trophoblastic cancer, usually of the woman's placenta. However, they rarely exist in men, accounting for less than 1% to 3% of all the testicular neoplasms. They can also be found in combination with other germ cell tumor elements in 8% of testicular germ cell tumors. Tumors are mostly found in patients in their second to fourth decade of life. Choriocarcinomas are highly malignant lesions with the potential for early,
hematogenous metastases to the lung, liver, gastrointestinal tract, and brain. Choriocarcinoma has the worst prognosis of all germ cell tumors.

Spermatocytic seminoma

The name of the tumor comes from the similarity (under the microscope) between the small cells of the tumor and secondary spermatocytes. Spermatocytic seminoma is a rare tumor, comprising only one to two percent of all testicular germ cell tumors. Men presenting with this tumor are generally 50 to 60 years old, and its occurrence is rare in men under 30 years old. Most present with slow, painless testicular enlargement, which may involve both testes.

2. Sex cord/Gonadal stromal tumors

Granulosa cell tumor

Although granulosa cells normally occur only in the ovary, granulosa cell tumors occur in both ovaries and testicles. These tumors should be considered malignant and treated in the same way as other malignant tumors of the ovary.

Sertoli cell tumor

This tumor produces Sertoli cells, which are normally found in the testicle. Sertoli cell tumor occurs in both men and women. Due to excess estrogen secreted by these tumors, one-third of male patients may present with a recent history of progressive feminization.

Thecoma

Thecomas or theca cell tumors are benign neoplasms composed only of theca cells. Histogenetically they are classified as sex cord-stromal tumors. Males with these tumors may present with signs and symptoms of estrogen or androgen excess, including gynecomastia, impotence or decreased libido. The most common presentation in males remains a painless testicular mass.

Leydig cell tumor

The majority of Leydig cell tumors are found in men, usually at 5–10 years of age or in middle adulthood (30–60 years). Children typically present with precocious puberty. Adults with Leydig cell tumors have testicular swelling, and decreased libido (20%) some of them could suffer from gynecomastia (15-30%). Pseudoprecocity is usually seen in children. Most tumors are unilateral and only 3% are bilateral. The tumor is well-circumscribed and occasionally encapsulated. Hemorrhage or necrosis are present in 25% of the cases, and extraparenchymal extension is in 10-15 % of cases.

3. Mixed Germ Cell and Sex Cord/Gonadal Stromal Tumor

Gonadoblastoma

A gonadoblastoma is a complex neoplasm composed of a mixture of gonadal elements, such as large primordial germ cells, immature Sertoli cells or granulosa cells of the sex cord, and gonadal stromal cells. Most gonadoblastomas are benign.

4. Miscellaneous tumors of the testis

Carcinoid
Carcinoid tumors are the most commonly encountered small bowel malignancy and are believed to arise from neuroendocrine cells. They are classically found at the tip of the vermiform appendix or the terminal ileum although they have also been described to occur in the lungs, pancreas, rectum, and genitourinary tract. Carcinoid tumors of the testis are a rare entity comprising less than one percent of all testis tumors. Carcinoid tumors of the testis can arise as a metastasis from an extratesticular primary, as a component of a teratoma, or as a primary tumor, with primary tumor being most common. Their presence should be considered particularly when evaluating a testicular lesion in an older male patient. Primary carcinoid tumors of the testis are associated with an excellent prognosis; however, surveillance is important given rare reports of delayed metastases.

**Associated disease**
- cryptorchidism

**Complications**

Malignant testicular tumors may spread to some other parts of the body. After the tumor cells come to rest at another site, they re-penetrate the vessel or walls and continue to multiply, eventually forming another clinically detectable tumor. This new tumor is known as a metastatic (or secondary) tumor. Metastasis is one of three hallmarks of malignancy (contrast benign tumors). The most common metastasis location are lungs, abdomen, spine and retroperitoneal area.

**Risk factors**

The exact cause of testicular cancer is usually not known. Risk factors for developing testicular cancer may include family history of testicular cancer, previous cancer in one testicle, tobacco use and undescended testis.

**Impact on fertility**

If the physicians detect a tumor, it is necessary to get rid of an abnormal tissue of testicle. Tumor could be removed surgically, or it could be destroyed chemotherapy or radiotherapy. When the cancer is not spread in both testicles, a man with one remaining testis may maintain fertility. Thus might be due to the fact that the tissue still can produce a healthy sperm. This sperm can be capable of insemination. However, sperm banking may be appropriate for men who still plan to have children, since fertility may be adversely affected by chemotherapy and/or radiotherapy or in case that cancer relapses. A man who lost both testicles is infertile and sperm donation should be considered.

**Prevention**

Maintaining a healthy lifestyle and avoiding exposure to known cancer-causing substances such as tabacco, alcohol, obesity and radiation.

**Symptoms**
- a lump in one testis which may or may not be painful
- sharp pain or a dull ache in the lower abdomen or scrotum
- a feeling often described as “heaviness” in the scrotum
- breast enlargement (gynecomastia)
• low back pain (lumbago) due to the cancer spreading to the lymph nodes along the back
• testicular atrophy
• palpable testicular mass
• asymmetric testicular enlargement
• haemetmesis
• neurologic abnormalities
• chest pain
• precocious puberty
• swelling
• flushing
• diarrhea
• wheezing
• abdominal cramping
• peripheral edema
• alpha- fetoprotein in serum, cerebrospinal fluid, urine, rarely in amniotic fluid
• shortness of breath (dyspnea), cough or coughing up blood (hemoptysis) from metastatic spread to the lungs
• a lump in the neck due to metastases to the lymph nodes

Therapies

Self therapy

In the treatment of testicular cancer, nutrition therapy is individualized personally, based on body fat, immune system, staging and medical history. It usually involves an increase of fruits, vegetables and whole grains as well as yogurt, fish and poultry.

Conventional medicine

Pharmacotherapy

Chemotherapy is the standard treatment for nonseminoma when the cancer has spread to other parts of the body. The standard chemotherapy protocol includes three, or sometimes four, rounds of Bleomycin-Etoposide Cisplatin (BEP). An alternative, equally effective treatment involves the use of four cycles of Etoposide-Cisplatin (EP). The increase in survival and cure rate in the last decades has been due mainly to effective chemotherapy.

Lymph node surgery may also be performed after chemotherapy to remove masses left behind (stage 2 or more advanced), particularly in the cases of large nonseminomas.

As an adjuvant treatment, use of chemotherapy as an alternative to radiation therapy in the treatment of seminoma is increasing, because radiation therapy appears to have more significant long-term side effects (for example, internal scarring, increased risks of secondary malignancies, etc.). Two doses, or occasionally a single dose of carboplatin, typically delivered three weeks apart, is proving to be a successful adjuvant treatment, with recurrence rates in the same ranges as those of radiotherapy. Since seminoma can recur decades after the primary tumor is removed, patients receiving adjuvant chemotherapy main vigilant and not assume they are cured 5 years after treatment.

Psychotherapy

Cancer support groups provide a setting in which cancer patients can talk about living with cancer with others who may be having similar experiences. Much of the sociological...
construction of these groups is similar to other kinds of other types of support groups.

Although the experience of people diagnosed with cancer varies greatly from one person to another, they all need a good support system in order to cope throughout the different stages of the process. Different support systems have thus been developed including community support groups, online support groups, networks, forums, and charitable organizations. Community support groups are usually led by psychologists, social workers, and medical professionals and can take place in churches, hospitals, or community centers. Online support groups and forums are a good option for those patients who find it difficult to leave their home during treatment. People participating in such forums have the possibility to maintain their anonymity. Support systems range from those that address patients suffering from specific types of cancer to those that support patients suffering from any kind of cancer.

**Surgical therapy**

The initial treatment for testicular cancer is surgery to remove the affected testicle (orchiectomy). While it may be possible, in some cases, to remove testicular cancer tumors from a testis while leaving the testis functional, this is almost never done, as the affected testicle usually contains pre-cancerous cells spread throughout the entire testicle. Thus removing the tumor alone without additional treatment greatly increases the risk that another cancer will form in that testicle.

Since only one testis is typically required to maintain fertility, hormone production, and other male functions, the afflicted testis is almost always removed completely in a procedure called inguinal orchiectomy. The testicle is almost never removed through the scrotum; an incision is made beneath the belt line in the inguinal area.

In the case of nonseminomas that appear to be stage I, surgery may be done on the retroperitoneal/paraaortic lymph nodes (in a separate operation) to accurately determine whether the cancer is in stage I or stage II and to reduce the risk that malignant testicular cancer cells that may have metastasized to lymph nodes in the lower abdomen. This surgery is called retroperitoneal lymph node dissection (RPLND). Sperm banking is frequently carried out prior to the procedure (as with chemotherapy), as there is a risk that RPLND may damage the nerves involved in ejaculation, causing ejaculation to occur internally into the bladder rather than externally.

**Other therapy**

Seminoma cells are extremely radiosensitive, and radiation therapy has been widely used for more than 60 years, and has an excellent long-term track record. Radiation may be used to treat stage 2 seminoma cancers, or as adjuvant (preventative) therapy in the case of stage 1 seminomas, to minimize the likelihood that tiny, non-detectable tumors exist and will spread (in the inguinal and para-aortic lymph nodes). Radiation is ineffective against and is therefore never used as a primary therapy for nonseminoma.

**Assisted reproduction**

Sperm function is affected after chemotherapy or radiotherapy, so lots of men use sperm bank that collects and stores human sperm. Man’s own sperm obtained by microsurgical methods (TESE, micro-TESE, etc.) may be also used but this approach is generally not suggested due to very high risk of their genetic damage after chemotherapy/radiation treatment. Otherwise, it is recommended to perform PGS on resulting embryos. Sperm donation is another option to bear in mind if a man wishes to have a child and his sperm are
Find more about related issues

Diagnoses

**Undescended testes**
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.
Learn more at: www.fertilitypedia.org/therapy/diag/undescended-testes

**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

**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

Organs

**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

**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

Biological control

**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

Reproductive functions

not in a sufficient number or quality. Then, the IVF or IVF-ICSI procedure can be done.
Erection
The physiological process by which a penis becomes erect by being engorged with blood.
Learn more at: www.fertilitypedia.org/edu/reproductive-functions/erection

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

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

⚠️ Risk factors

Smoking
Long-lasting inhalation of the smoke of burning tobacco.
Learn more at: www.fertilitypedia.org/therapy/ rf/smoking-1

(rb) Symptoms

Abdominal pain
A pain that occurs between the chest and pelvic regions.
Learn more at: www.fertilitypedia.org/edu/symptoms/abdominal-pain

Atrophy of the testicles
A not-temporary condition in which the testes diminish in size and may be accompanied by loss of function.
Learn more at: www.fertilitypedia.org/edu/symptoms/atrophy-of-the-testicles

Chest pain
A pain is felt anywhere in the chest area from the level of shoulders to the bottom of ribs.
Learn more at: www.fertilitypedia.org/edu/symptoms/chest-pain

Diarrhea
The condition of having at least three loose or liquid bowel movements each day.
Learn more at: www.fertilitypedia.org/edu/symptoms/diarrhea

Early puberty in boys
The onset of puberty before the average age in boys (9 years).
Learn more at: www.fertilitypedia.org/edu/symptoms/early-puberty-in-boys

Gynecomastia
A disorder of the endocrine system in which there is a non-cancerous swelling of the breast tissue in boys or men.
Learn more at: www.fertilitypedia.org/edu/symptoms/gynecomastia

Lower back pain
A common painful disorder involving the muscles and bones of the back.
Learn more at: www.fertilitypedia.org/edu/symptoms/lower-back-pain
Testicular pain
A discomfort felt in the testicles (testes) or scrotum.
Learn more at: www.fertilitypedia.org/edu/symptoms/testicular-pain

Therapies

Chemotherapy of testicular cancer
A therapeutic option for testicular cancer, which uses anti-cancer drugs.
Learn more at: www.fertilitypedia.org/edu/therapies/chemotherapy-of-testicular-cancer

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

Orchiectomy
Surgical removal of one or both testes.
Learn more at: www.fertilitypedia.org/edu/therapies/orchiectomy

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

Radiation therapy of testicular cancer
A therapy of testicular cancer, which uses ionizing radiation to shrink tumors and kill cancer cells.
Learn more at: www.fertilitypedia.org/edu/therapies/radiation-therapy-of-testicular-cancer

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
Seminoma of the Testis
Rust of testicle with seminoma.

Seminoma histology
Micrograph of a testicular seminoma. H&E stain.

Teratoma histology
Micrograph of a mature teratoma. H&E stain.

Spermatocytic seminoma
Small cells with a large nucleus-cytoplasm ratio. Medium cells with prominent nucleoli. Large cells with filamentous chromatin.

Sertoli cell tumour
Groups of cells in chords or trabeculae (beam-like arrangement). Cells resemble those found in immature seminiferous tubules.
Leydig cell tumour

Leydig tumour has cells with moderate nuclear size variation, and cells with prominent round central nucleoli and an eosinophilic vacuolated cytoplasm.

Sources

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