

Cancer Association of South Africa (CANSA)



CANSA Fact Sheet on Testicular Cancer and Male Fertility

Introduction

Male infertility refers to a male's inability to cause pregnancy in a fertile female. In humans it accounts for 40-50% of infertility. Male infertility is commonly due to deficiencies in semen, and semen quality is used as a surrogate measure of male fertility.



[Picture Credit: Sperm]

Individuals who learn they are infertile often experience the normal but nevertheless distressing emotions common to those who are grieving any significant loss — in this case the ability to procreate. Typical reactions include shock, grief, depression, anger, and frustration, as well as loss of self-esteem, self-confidence, and a sense of control over one's destiny.

Darabos, K. & Hoyt, M.A. 2020.

“Coping through emotional processing (EP) with cancer-related circumstances can take several forms, including methods thought to be constructive (e.g., planning, meaning making) and unconstructive (e.g., rumination). These forms can have differential relationships with experiences of stress. Associations of coping through constructive and unconstructive EP in expressive writing with salivary stress biomarkers were examined among young adult testicular cancer survivors. Constructive processing was significantly associated with less overall daily cortisol output and smaller salivary alpha-amylase awakening response; unconstructive processing was also associated with lower daily cortisol output. These preliminary results from this exploratory study inform future research associating emotion-regulation coping and biological stress reactivity.”

Wang, A.W. & Hoyt, M.A. 2020.

BACKGROUND AND OBJECTIVES: Perceiving benefit from a health-related stressor such as cancer has been associated with better psychological adjustment in various cancer populations; however, it has not been studied in the context of young adulthood or gender-related cancer threat. This study investigated the role of benefit finding in psychological adjustment among young adults with testicular cancer, and whether BF moderates cancer-related masculine threat.

DESIGN: This study utilizes a cross-sectional design with a diverse sample of young adult testicular cancer survivors.

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METHODS: Men with a history of testicular cancer ($N = 171$; M age = 25.2, $SD = 3.32$) completed questionnaires of benefit finding, cancer-related masculine threat, and indicators of psychological adjustment.

RESULTS: Multiple regression analysis revealed that cancer-related masculine threat was associated with worse adjustment across indicators and that benefit finding was related to higher positive affect and lower depressive symptoms. Benefit finding attenuated the potentially adverse effect of cancer-related masculine threat on negative affect and depressive symptoms such that cancer-related masculine threat demonstrated a stronger association with negative affect and depressive symptoms for people with relatively low BF.

CONCLUSIONS: For young adult men with testicular cancer, finding benefit appears to promote well-being in the face of masculine cancer threat.

The Male Reproductive System

The male reproductive tract is made up of the testes, a system of ducts (tubes) and other glands opening into the ducts.

The testes (testis: singular) are a pair of egg shaped glands that sit in the scrotum next to the base of the penis on the outside of the body. Each normal testis is 15 to 35ml in volume in adult men. The testes are needed for the male reproductive system to function normally.

The testes have two related but separate roles:

- production of sperm
- production of the male sex hormone, testosterone.

Male infertility can be caused by problems that affect sperm production or the sperm transport process. With the results of medical tests, doctors are able to find the cause of the problem.

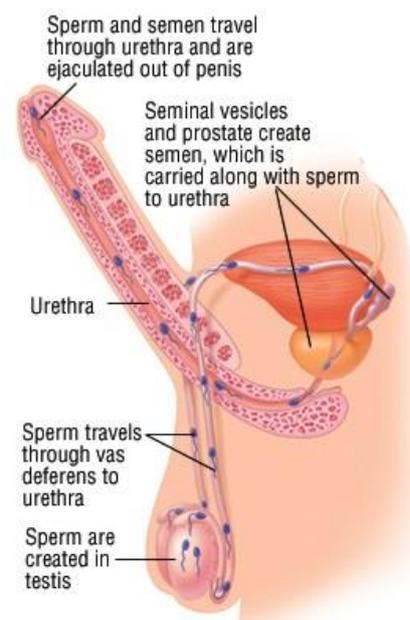
Sperm production problems: The most common cause of male infertility is due to a problem in the sperm production process in the testes. Low numbers of sperm are made and/or the sperm that are made do not function properly. About two thirds of infertile men have sperm production problems.

Blockage of sperm transport: Blockages (often referred to as obstructions) in the tubes leading sperm away from the testes to the penis can cause a complete lack of sperm in the ejaculated semen.

[Picture Credit: Fertility]

This is the second most common cause of male infertility and affects about one in every five infertile men, including men who have had a vasectomy but now wish to have more children.

Sperm antibodies: In some men, substances in the semen and/or blood called sperm antibodies can develop which can reduce



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sperm movement and block egg binding (where the sperm attaches to the egg) as is needed for fertilisation. About one in every 16 infertile men has sperm antibodies.

Sexual problems: Difficulties with sexual intercourse, such as erection or ejaculation problems, can also stop couples from becoming pregnant. Sexual problems are not a common cause of infertility.

Hormonal problems: Sometimes the pituitary gland does not send the right hormonal messages to the testes. This can cause both low testosterone levels and a failure of the testes to produce sperm.

Hormonal causes are uncommon, and affect less than one in 100 infertile men. Unfortunately, medical scientists do not yet understand all the details of sperm production and the fertilisation process. As a result, for many men with a sperm production problem, the cause cannot be identified.

Incidence of Testicular Cancer in South Africa

The following South African statistics regarding histologically diagnosed cases of testicular cancer during 2019 are available from the outdated National Cancer Registry (2019) known for under reporting:

Group 2019	Actual No of Cases	Percentage of All Cancers	Estimated Lifetime Risk
All males	234	0,56%	1:1 578
Asian males	20	1,95%	1:674
Black males	47	0,20%	1:4 505
Coloured males	33	0,64%	1:1 153
White males	134	0,63%	1:223

The frequency of histologically diagnosed cases of testicular cancer in South Africa for 2019 was as follows (National Cancer Registry, 2019):

Group 2019	0 – 19 Years	20 – 29 Years	30 – 39 Years	40 – 49 Years	50 – 59 Years	60 – 69 Years	70 – 79 Years	80+ Years
All males	14	59	85	44	14	10	7	1
Asian males	2	10	7	1	0	0	0	0
Black males	8	7	13	10	3	2	3	1
Coloured males	1	10	13	3	3	1	2	0
White males	3	32	52	30	8	7	2	0

Testicular Cancer and Infertility

Testicular cancer affects men mostly in their reproductive age and occurs mostly in men between the ages of 15 and 49. Fertility problems are usually complex and when testicular cancer is involved, they become even more complicated.

Testicular cancer and its treatment can affect hormone levels and might affect a man's ability to father children after treatment. It is, therefore, important to discuss the possible effects with a doctor before starting testicular cancer treatment so that one is aware of the risks and what options may be available.

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Most boys and men who develop testicular cancer, develop cancer in only one testicle. The remaining testicle usually can make enough testosterone (the main male hormone) to keep the person healthy. If the other testicle needs to be removed because the cancer is present in both testicles, or if a new cancer develops in the other remaining testicle, the individual will need to take some form of testosterone supplementation for the rest of his life. Most often this is in the form of a gel or patch that is applied to the skin or a monthly injection.

Testicular cancer, or its treatment, can make a person infertile (unable to father a child). Before treatment starts, men who might wish to father children later in life, may want to consider storing sperm in a sperm bank for later use. Infertility can be an issue later in life for boys who had testicular cancer. If a boy has already gone through puberty, sperm banking is often a good option, since the frozen samples are not damaged by long periods of storage. Researchers are currently looking at new techniques that might allow younger boys to someday father children.

Martin, T., Dank, M., Biró, K., Küronya, Z., Gyergyay, F., Nagyiványi, K., Budai, B., Fűrész, K. & Gécz, L. 2021.

“Germ cell tumors of the testicle account for 1% of all tumors. Testicular cancer (TC) is the most common malignancy in men aged 15-35 years. Patients with TC have an excellent survival rate but often have not yet attempted to father children, and fertility is one of the main concerns of survivors, therefore it is important to preserve it. The most commonly used method is sperm banking. Retrospective analysis of the Hungarian data showed that in case of testicular cancer spermatogenesis is more impaired in the more advanced disease. No correlation was found among the histological types and the proportion of azoo- and oligozoospermia. The parameters of testicular cancer and non-Hodgkin lymphoma patients were worse compared to the normal population. Sperm cryopreservation prior to initiating life-saving cancer treatment offers men the best chance to father children and should be offered to all men with testicular cancer before chemotherapy, since cytostatic therapy may lead to infertility.”

Parekh, N.V., Lundy, S.D. & Vij, S.C. 2020.

“The modern approach to cancer management has evolved into a multidisciplinary initiative focused not only on cancer specific and overall survival, but also patient quality of life and survivorship. Future fertility is often a major concern for young patients undergoing cancer therapy. Fertility preservation has emerged as a viable but significantly underutilized option. Patients and families should be aware of the varying effects of antineoplastic therapy on their future fertility to allow for an informed decision regarding their fertility preservation options. In this review we discuss the epidemiology, pathophysiology, and management of fertility in the setting of testicular cancer diagnosis and treatment.”

Surgery for Testicular Cancer and Fertility

Removing a testicle will not affect a person’s sexual performance or his ability to father children. The healthy testicle (unless it is very small) will produce more testosterone and sperm to make up for the testicle that has been removed.

Men who have an operation to also remove the retroperitoneal lymph nodes may get nerve damage, which will cause retrograde ejaculation, meaning that sperm goes backwards during ejaculation into the bladder instead of coming out through the tip of the penis. The sperm is then

passed out harmlessly in the urine. This type of surgery does not stop a person from getting an erection or having sex, but the orgasm will feel different because it is 'dry' (a dry climax).

New surgical techniques mean that this problem can be avoided. It is important, however, to speak to the treating specialist beforehand for advice about storing sperm.

Radiation Therapy for Testicular Cancer and Fertility

Radiation therapy can cause infertility in two distinct ways:

Primary testicular damage - occurs from radiation aimed directly at or near the testicles. Spermatogonia (sperm forming) cells are extremely sensitive to the effects of radiation therapy. Doses as low as 600 cGy can cause irreversible damage to the sperm forming cells. Doses less than this may cause a temporary drop in the number and quality of sperm produced.

Testicular leukaemia - one to two percent of boys have leukaemia cells in the testicles at the time of their leukaemia diagnosis. This is determined by examining the testicles; in some cases a biopsy may be required. Stronger treatment is usually given to boys that have leukaemia in the testicles, and some will need to get radiation therapy.

Scatter radiation is the term used to describe radiation that occurs in areas not directly within the radiation therapy treatment field, but near to it. Examples of radiation sites that may result in scatter radiation to the testis include: radiation to the lymph nodes in the lower abdomen used for treatment of higher stage Hodgkin's Lymphoma or testicular cancer, or radiation delivered to the upper thigh for a tumour located in this area. Lead shields are used to protect the testis when the treatment field is nearby, but small amounts of radiation exposure may still occur.

Leydig cells are relatively resistant to the damaging effects of radiation therapy. Normal function remains following exposure or treatment with doses less than 2400cGy. This is important because Leydig cells produce testosterone, which is required for normal sexual development and normal sexual activity.

Secondary or indirect testicular failure - may occur following radiation therapy to the brain. Radiation may damage the pituitary gland, located in the brain, which is responsible for secreting hormones needed for normal sexual function. Pituitary damage may result in low doses of the hormones (FSH and LH) needed to stimulate the sperm forming cells and Leydig cells. Both LH and FSH are produced in the brain by the pituitary gland. High levels of radiation to the brain can damage the pituitary gland, resulting in an inability to produce the hormones FSH or LH. This in turn causes infertility and low testosterone levels.

Chemotherapy for Testicular Cancer and Infertility

Not all chemotherapy drugs affect fertility in men. But some can. It may affect male fertility:

- By reducing the number of sperm produced
- By affecting the sperm's ability to fertilise an egg

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If this happens it may be temporary or permanent and, if permanent, means that the individual will no longer be able to father children. Whether it is temporary or permanent depends on the drugs used, the doses administered and the age of the patient. Permanent infertility is more likely if higher doses of the drugs are administered.

It is important to use contraception throughout treatment. It is not advisable to father a child while receiving chemotherapy – the drugs could harm the baby.

Some chemotherapy drugs can affect the nerves in the genital area. This can temporarily make it difficult to get or maintain an erection. This usually gradually gets better once the treatment is finished. Usually one can still get an erection and have an orgasm as before. Chemotherapy drugs do not normally have any permanent effect on sexual performance or enjoyment of sex.

It is extremely difficult to predict which men will become infertile as a result of chemotherapy treatments. The effects are dependent on the type and number of chemotherapy drugs received, as well as the cumulative dose received.

Lowering the Risk of Testicular Cancer Coming Back

Many individuals ask whether there are specific lifestyle changes they can make to reduce their risk of testicular cancer coming back. Unfortunately, for most cancers there is little solid evidence to guide people. This does not mean that nothing will help – it is just that for the most part this is an area that has not been well studied. Not enough is known about testicular cancer to say for sure if there are things one can do that will be helpful.

Adopting healthy behaviours such as not smoking, avoiding alcohol, eating well, being active, and staying at a healthy weight may help, but no one knows for sure.

Semen Analysis at Lancet Laboratories

Semen analysis is a test of a man's sperm and semen. Also known as a sperm count or male fertility test, its results show how many sperm are released, as well as how they're shaped and how well they move. Semen is the thick fluid that comes from men's penis when they ejaculate during sexual activity.

Semen analysis is done on appointment only and samples can only be submitted at certain Lancet Laboratories.

Please see “**Service points**” as well as the “**Cost of the test**” below and then phone us during office hours for an appointment (see contact numbers below).

1. Abstain from all sexual activity (including masturbation) for a minimum of 3 days but not longer than 7 days before sample collection.
2. Please produce the specimen at home. A sterile container is needed for semen collection and can be collected from any Lancet Laboratory close to you. Ask for a “urine container”.
3. The sample should be collected by masturbation and ejaculation of the semen directly into this container. The **whole** ejaculate must be collected.

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4. Close the lid tightly after collection to prevent leakage. Do not wrap the container in anything.
5. Do NOT use soaps, detergents, water, lubricants or condoms to help with specimen collection as these may affect the results.
6. No sex should be involved during specimen collection.
7. Semen must NOT be exposed to temperature fluctuations. It must be kept body temperature till it is submitted to the lab. Ideally, keep the sample close to your body (inside the trousers' pocket). Do NOT heat or refrigerate the sample.
8. The sample must arrive at the laboratory within 1 ½ hour of being produced.
9. If you had a vasectomy, please allow at least 8 weeks after the operation before you give a specimen to be tested.

Cost of the test:

Semen analysis: **R1300** and Post vasectomy test: **R250 (latest known cost)**

No medical aids are accepted. Please claim from your medical aid afterwards.

You can also have the test done at the following locations which you can contact at the numbers given below:

KZN (Durban) – 031 308 6558/29/00

Cape Town – 021 673 1700

Polokwane – 015 294 0400

Nelspruit – 013 752 8407

Tzaneen – 015 307 4849

Rustenburg – 014 597 8510

Potchefstroom – 018 293 8260

Sperm Banking – Semen Cryopreservation

Sperm banking (semen cryopreservation) involves harvesting and then freezing sperm at very low temperatures around minus 196°C (a home freezer will not work!). Men may choose to bank sperm if there is a possibility of losing fertility. This is an important option for men who have not established a family or whose family is not yet complete.

[Picture Credit: Cryopreservation]



Ucar, M.A., Arikan, F., Coskun, H.S., Kondak, Y., Tatli, Al M. & Göksu, S.S. 2020.

Erratum in

Correction to: Fertility in testicular cancer patients: a single-centre study in Turkey.

Uçar MA, Arikan F, Coşkun HŞ, Kondak Y, Tatlı AM, Göksu SS. *Int J Clin Oncol.* 2020 Mar;25(3):501. doi: 10.1007/s10147-019-01572-1. PMID: 31797189

Background: Testicular cancer is a rare type of cancer in males. Since the disease is seen in young men and long-term survival is ensured following a high treatment success rate, fertility in testicular cancer patients is much more important. Prior to commencement of cancer treatment, patients are

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given counselling with regard to infertility and sexual function, and sperm banking is commonly carried out. The aim of this study was to assess the fertility status prior to and following treatment of monitored testicular cancer patients whose treatment had been completed.

Methods: 110 patients diagnosed with and treated for testicular cancer at the Medical Oncology Clinic at Akdeniz University during the years 2000-2016 were evaluated for the study. The patients' disease and treatment information was obtained from their records. The patients' characteristics and fertility statuses were determined by means of interviews with the patients.

Results: The median age of the patients was 36 (20-73) and 39.1% of them (n = 43) were aged between 30 and 39. The average length of follow-up was 6.20 ± 3.36 (2-17) years. It was determined that 42.7% of the patients had banked sperm following diagnosis and that 74.5% of them had received counselling. Following treatment, 33 patients (30%) fathered children. The average time taken to father children after treatment was 3 years.

Conclusion: In testicular cancer patients, fatherhood is achieved spontaneously or with the cryopreservation process. Counselling plays an important role at the time of diagnosis. It is essential that health professionals in oncology clinics give counselling about fertility in testicular cancer.

Reasons Why Men Should Consider Semen Cryopreservation

- Before undergoing cancer therapies – therapies such as surgery, chemotherapy and radiation can cause permanent sterility and infertility
- Before having prostate or testicular surgery – damage can be caused to a man's reproductive organs and/or nerve supply during testicular surgery and prostatectomy
- Before having a vasectomy – to preserve fertility and prevent the need for reversal surgery if personal circumstances change
- High risk occupations – men exposed to chemical, radiation, extreme heat, etc can lead to infertility
- When men are going to be absent – semen freezing enables the female partner to continue with her reproductive schedule even if the male partner cannot be there due to work commitments or unforeseen circumstances
- Professional sportsmen (especially cyclists) – strenuous and consistent impact can lead to infertility

In a study by **Quinn, et al.**, (2014) they found that out of a total of 231 records of adolescent and young adult men, in only 13% of cases was there any evidence of referral to a fertility specialist. They concluded that there is a need to create interventions to improve this.

Levi-Setti, P.E., Negri, L., Baggiani, A., Morengi, E., Albani, E., Dioguardi, C.M.C., Specchia, C. & Patrizio, P. 2020.

OBJECTIVE: To assess rates of successful testicular sperm retrieval and intracytoplasmic sperm injection (ICSI) outcome in cancer survivors affected by non-obstructive azoospermia (NOA) or retrograde ejaculation (RE)/failure of emission (FOE).

METHODS: A retrospective analysis of cancer survivors who did not cryopreserve sperm prior to treatment undergoing testicular sperm extraction (TESE). Non-cancer NOA patients and neurologic RE/FOE were the control group.

RESULTS: A total of 97 cancer survivors were offered TESE and 88 (91%) accepted. Sperm was retrieved and cryopreserved in 34/67 patients with NOA (50.7%) and in 21/21 patients affected by RE/FOE (100%). Sperm retrieval rates were similar in the control group (44.9% in NOA and 100% in RE/FOE). The ICSI cumulative pregnancy rate (60%) and live birth rate (40%) per couple in 30 NOA

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men did not differ from controls (50.0 and 46.5%, respectively; $p = 0.399/0.670$). The cumulative pregnancy rate (66.7%) and live birth rate (55.6%) in 18 RE/FOE men did not differ from the control group (38.9 and 33.3%, respectively; $p = 0.181/0.315$). The cancer type and the resulting infertility disorder (NOA or RE/FOE) were not associated with ICSI outcomes. Female partner age was inversely related to the cumulative live birth rate, being fourfold lower (11.5%) in women ≥ 40 years and 48.8% in younger women ($p = 0.0037$).

CONCLUSIONS: The rate of successful TESE and the ICSI outcome in cancer survivors with NOA and RE/FOE is the same as non-cancer azoospermic patients. Female partner age (older than 40 years) was associated with a significant reduction in live birth rates after TESE-ICSI procedures.

Can One Freeze One's Own Sperm?

Even though there are collection and storage kits that allows one to initially collect and Freeze one's own specimen at home, but this process is not intended for storage in the kitchen freezer. The necessary temperature for maintaining sperm viability is far colder than a home freezer maintains.

Cryopreservation is the process of freezing biological material at extremely low temperatures - most commonly minus 196 °C.

Sperm Banking (Semen Cryopreservation) in South Africa

In South Africa sperm banking (semen cryopreservation) can be arranged through:

Vitalab Centre for Assisted Conception

Tel 0861 882522

<http://www.vitalab.com/treatment-programs/sperm-freezing/>

Discovery Health

In a unique offering, we have been able to arrange an exclusive offer for members with Next Biosciences – Africa's leading Biotech Company that combines medicine, science and technology to create innovative products and services, enabling you to invest in your future health. Members on selected schemes administered by Discovery Health can get up to 25% off Cryo-Y, Next Biosciences' semen cryopreservation service.

<https://www.discovery.co.za/medical-aid/semen-cryopreservation>

Next Biosciences

Tel 011 697 2900/0861 NET CELLS (6382355)

NetCells Biosciences

Tel: 0861 NETCELLS

<https://www.netcells.co.za/reproductive-sperm.php?gclid=CluTr9e3zMECFVHMtAodNFkArQ>

Androcryos

Tell: 011 484 2695

<http://androcryos.co.za/lab/contact-us.html>



Cape Cryobank

Tell: 021 674 2088

<http://capecryobank.co.za/>

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Your Parenting

<http://www.yourparenting.co.za/fertility/treatment-options/sperm-banking-for-life>

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

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Sources and References Consulted or Utilised

American Cancer Association

<http://www.cancer.org/cancer/testicularcancer/detailedguide/testicular-cancer-after-lifestyle-changes>
<http://www.cancer.org/cancer/testicularcancer/detailedguide/testicular-cancer-after-fertility>

Andrology Australia

<https://www.andrologyaustralia.org/reproductive-problems/male-infertility/>

Attain Fertility

<http://attainfertility.com/article/testicular-cancer>

Bruni, L., Albero, G., Serrano, B., Mena, M., Gómez, D., Muñoz, J., Bosch, F.X. & de Sanjosé, S. 2019. ICO/IARC Information Centre on HPV and Cancer (*HPV Information Centre*). Human Papillomavirus and Related Diseases in South Africa. Summary Report 17 June 2019. [Date Accessed]

Cancer.Net

<http://www.cancer.net/cancer-types/testicular-cancer/after-treatment>

Cancer Research UK

<http://www.cancerresearchuk.org/about-cancer/type/testicular-cancer/living/fertility-having-children-after-testicular-cancer>

<http://www.cancerresearchuk.org/about-cancer/cancers-in-general/treatment/chemotherapy/fertility/mens-fertility-and-chemotherapy>

Comprehensive Cancer Centre, University of Michigan Health System

<http://www.mcancer.org/fertility-preservation/for-male-patients/cancer-and-male-infertility>

Cryopreservation

<http://www.innaifest.com/ec/en/fertility-preservation/semens-cryopreservation-and-storage>

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Cure Search for Children's Cancers

<http://www.curesearch.org/Acute-Lymphoblastic-Leukemia-in-Children-Treatment-Information/>

Darabos, K. & Hoyt, M.A. 2020. Emotional processing coping methods and biomarkers of stress in young adult testicular cancer survivors. *J Adolesc Young Adult Oncol*. 2020 Jan 22. doi: 10.1089/jayao.2019.0116. [Epub ahead of print]

Everyday Health

<http://www.everydayhealth.com/testicular-cancer/fertility-after-treatment.aspx>

Fertility

<http://www.drugs.com/health-guide/vasectomy.html>

Fertility Factor

<http://www.fertilityfactor.com/testicular-cancer-infertility.html>

Harvard Medical School

http://www.health.harvard.edu/newsletters/Harvard_Mental_Health_Letter/2009/May/The-psychological-impact-of-infertility-and-its-treatment

Joly, F., Ahmed-Lecheheb, D., Thiery-Vuillemin, A., Orillard, E. & Coquan, E. 2019. Side effects of chemotherapy for testicular cancers and post-cancer follow-up. *Bull Cancer*, 106 (9), 805-811. Sep 2019.

Levi-Setti, P.E., Negri, L., Baggiani, A., Morengi, E., Albani, E., Dioguardi, C.M.C., Specchia, C. & Patrizio, P. 2020. Testicular sperm extraction and intracytoplasmic sperm injection outcome in cancer survivors with no available cryopreserved sperm. *J Assist Reprod Genet*. 2020 Jan 24. doi: 10.1007/s10815-020-01697-7. [Epub ahead of print]

MacMillan Cancer Support

<http://www.macmillan.org.uk/Cancerinformation/Cancertypes/Testes/Livingwithtesticularcancer/Sex%20fertility.aspx>

Martin, T., Dank, M., Biró, K., Küronya, Z., Gyergyay, F., Nagyiványi, K., Budai, B., Fűrész, K. & Géczi, L. 2021. Fertility preservation in testicular cancer patients. *Magy Onkol*. 2021 Mar 17;65(1):53-57.

Matos, E., Skrbinc, B. & Zakotnik, B. 2010. Fertility in patients treated for testicular cancer. *J Cancer Surviv*. Sep; 4(3):274-8. Doi: 10.1007/s11764-010-0135-9. Epub 2010 Jul 3.

Medscape

<http://www.medscape.com/viewarticle/757930?pa=wXX6Uo13xPMaTPyKG3h4jz23%2FVZ4f6iumIbFiPjp6e8HrHf5I012kdMZ2jDfXr%2BSuV386OwXbd24Q0rw9JasQ%3D%3D>

Oncolink

<http://www.oncolink.org/coping/article.cfm?c=534&id=992>

Parekh, N.V., Lundy, S.D. & Vij, S.C. 2020. Fertility considerations in men with testicular cancer. *Transl Androl Urol*, 9 (Suppl 1), S14-S23. Jan 2020.

Perelman School of Medicine

<http://www.medpagetoday.com/HematologyOncology/OtherCancers/13001>

Quinn, G.P., Block, R.G., Clayman, M.L., Kelvin, J., Arvey, S.R., Lee, J., Reinecke, J., Sehovic, I., Jacobson, P.B., Reed, D., Fonzaes, L., Vadaparampil, S.T., Laronga, C., Lee, M.C., Pow-Sag, J., Eggly, S., Franklin, A., Shah, B., Fulp, W.J. & Hayes-Lattin, B. 2014. If you did not document it, it did not happen: rates of documentation of discussion of infertility risk in adolescent and young adult oncology patients' medical records. *J Oncol Pract*, Dec. pii: JOP.2014.000786/ [Epub ahead of print]

Science Daily

<http://www.sciencedaily.com/releases/2009/02/090223221338.htm>

Semen Analysis

<https://www.google.co.za/search?q=semen+analysis&source=hp&ei=HVWbYYWvPJrS1sQP8oGTgAc&iflsig=ALs-wAMAAAAAYZtjLmesB3Xh20tuUTpjoaN-cO->

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3sMX8&ved=0ahUKEwjFsaP8xqv0AhUaqZUCHfLABHAQ4dUDCAc&uact=5&eq=semen+analysis&gs_lcp=Cgdnd3Mtd2I6EAMyCggAELEDEIMBEEMyBQgAEJECMgUIABCRAjIICAAQyQMqkQlyBAGAEEMyBAGAEEMyBQgAEIAEMgUIABCABDIECAAQZoLCAAQgAQQsQMqgwE6BwgAEMkDEEM6BwgAELEDEEM6CAgAEIAEELEDUABYzBpg6DJoAHAAeACAAaEDiAHTHZIBCDItMTIuMS4xmAEAoAEB&sclient=gws-wiz
<https://www.lancet.co.za/for-patients/guidelines-for-semen-analyses/>

Sperm

<http://www.wisegeek.org/what-are-the-most-common-neem-side-effects.htm#didyouknowout>

The Testicular Cancer Resource Center

<http://tcrc.acor.org/fertility.html>

The Turek Clinic

<http://theturekclinic.com/services/male-fertility-infertility-doctor-treatments-issues-zero-sperm-count-male-doctors/male-fertility-preservation-artificial-insemination-artificial-insemination-cost-0-after-cancer/>

Ucar, M.A., Arikan, F., Coskun, H.S., Kondak, Y., Tatli, Al M. & Göksu, S.S. 2020. Fertility in Testicular Cancer Patients: A Single-Centre Study in Turkey. *Int J Clin Oncol*, 25 (3), 495-500. Mar 2020.

Vaz, R.M., Bordenali, G. & Bibancos, M. 2019. Testicular cancer – surgical treatment. *Front Endocrinol (Lausanne)*, 10, 308. 2019 May 15 eCollection 2019.

Wang, A.W. & Hoyt, M.A. 2020. Cancer-related masculinity threat in young adults with testicular cancer: the moderating role of benefit finding. *Anxiety Stress Coping*. 2020 Jan 12:1-9. doi: 10.1080/10615806.2020.1713447. [Epub ahead of print]

WebMD

<http://www.webmd.com/men/news/20051104/fathering-child-after-testicular-cancer>

Wikipedia

https://www.google.co.za/?gws_rd=ssl#q=male+fertility