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Review

# Sexual functioning of testicular cancer survivors and their partners – A review of literature

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ABSTRACT

*Background:* Testicular cancer (TC) is the most common cancer in the 25–40 age group, with peak morbidity at around 30 years of age. It is a period of highest productivity, when sexual sphere is an important aspect of life. The disease, invasive treatment and its consequences interfere with this sphere.
*Aim:* The aim of this paper was to review the most recent studies on the sexual functioning of patients treated for testicular cancer and their partners published in English language scientific journals in the period of 1989–2010.
*Results:* Numerous studies report that men cured from testicular cancer are at risk of sexual disorders. Agents of psychological nature play an important role in the occurrence and persistence of sexual dysfunctions. Being in permanent relationship is a protective factor, while single persons are marked with particular predisposition to such dysfunctions. Sexual and marital satisfaction of TC survivors and their partners are mutually correlated.
*Conclusion:* With a growing number of TC survivors, a thorough investigation is required into their sexuality, both in an individual and dyadic dimension, so as to improve the quality of life of the affected young men, who take on their new social and professional roles in the period of highest reproductiveness.



## 1. Background

Testicular cancer, although relatively rarely diagnosed, is the most prevalent type of cancer in men between 25 and 40 years of age. It is a period of highest productivity, when sexual partners are chosen, families settled, professional careers started,[1] a time when sexual activity becomes an important aspect of life. Due to the nature of the involved organ, the cancer interferes with a broadly understood sexuality. It affects the organ which is associated with masculinity. A surgical intervention, irradiation or chemotherapy entail short- or long-term side effects that undermine one's sense of masculinity. This may lead to a decline of self-esteem and be reflected in a variety of sexual disorders.[2]

The disease affects the whole of family life. A note should be taken of psychological burden carried by the patient's partner. Mutuality of the relationship indicates that any disruption of an individual mental and sexual balance is reflected in the functioning and well being of the partner.

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**Table 1 – Summary of study results.**

| | |
|---|---|
| 1. | Men who survived testicular cancer are at risk of sexual disorders[7,8,10–13,15–18] |
| 2. | TC survivors who did not have a permanent relationship at the time of diagnosis and treatment are particularly exposed to various sexual dysfunctions[14,22] |
| 3. | Younger age is a protective factor[8,18] |
| 4. | Most sexual disorders are short lived[11,14–17] |
| 5. | The most sexual disorders are caused by chemotherapy and RLND[7,12,20] |
| 6. | Ejaculation disorder is the most prevalent sexual dysfunction[15,17,18] |
| 7. | TC treatment is often followed by a decline in sexual activity[8,12,13] |
| 8. | Ejaculation disorder is the only condition specifically related to RLND[7,11,15–17] or, in our study, to chemotherapy[18] |
| 9. | Psychological factors play a role in emergence and persistence of sexual dysfunctions[10,12,13,15,17,22] |
| 10. | Sexual satisfaction is relatively high despite sexual dysfunctions[8,12,13,15,18] |

*Source*: own study.

## 2. Aim

The aim of this paper was to review the most recent studies on the sexual functioning of patients treated for testicular cancer and their partners published in English language scientific journals in the period of 1989–2010.

## 3. Materials and methods

The paper systematises study results, identifies main research directions and indicates issues that require further investigation (Table 1). The scientific articles were found in the PubMed browser and the web by means of the following inputs: *testicular cancer + sexual function*, *testicular cancer + sexual functioning*, *testicular cancer + sexual satisfaction*, *testicular cancer + marital satisfaction*, *testicular cancer + sexual dysfunctions*. We also used references given in the journals.

## 4. Treatment of testicular cancer

Treatment of testicular cancer is a multidisciplinary process. It involves the removal of the testicle with tumour, otherwise known as orchiectomy. Further treatment depends on the type and clinical stage of cancer. Good-prognosis nonseminomas are observed or treated with dissection of retroperitoneal lymph nodes. In the case of dissemination, chemotherapy is applied (mainly according to the BEP protocol) with possible dissection of residual lesions. In the case of metastatic seminomas, a standard treatment involves chemotherapy with possible radiation therapy of the remaining lesions. The use of Retroperitoneal Lymph Node Dissection (RLND) is considered after completion of the cisplatin-based therapy. Around 20–30% of TC patients show no response to standard treatment modalities. They require more aggressive high-dose chemotherapy, including transplantation of marrow stem cells. Treatment is followed by many years of surveillance with a view to diagnose any possible recurrence at the earliest possible clinical stage. The highest risk of recurrence is observed within the first year after treatment.[3]

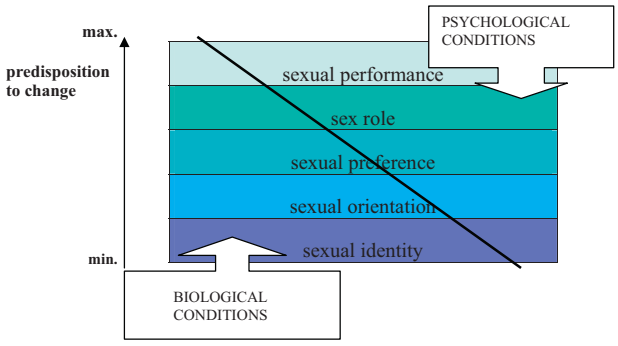


**Fig. 1 – Seligman's layer-based sexuality model.**

***Source*: based on Seligman (2003).**

Cisplatin-based chemotherapy, introduced in the 1980s, caused recovery rates to rise up to 90%, offering chance of recovery even to patients with extensive metastases. However, chemotherapy is an aggressive method of treatment. Patients may be affected with side effects whose occurrence and intensity depend on dose and individual predispositions. Frequently reported side effects are: (1) nausea and vomiting; (2) metallic taste in the mouth; (3) nose and gum bleeding, bruising; (4) fatigue and reduction in physical activity; (5) decrease of erythrocytes; (6) loss of hair; (7) oral ulceration; (8) fever and shivering; (9) hearing and balance disorders. Other complications include secondary cancers and damage to the lung parenchyma. BEP protocol chemotherapy may also damage the gonads and cause a temporary or permanent infertility. Adverse effects of the disease and its treatment on sexuality are estimated to occur in 15–60% patients. Most of these symptoms disappear soon after treatment and can be mitigated with a wide range of pharmaceuticals. Long-lasting effects include metabolic disorders, circulatory disturbances, damage to peripheral nerves, and infertility. This is the price that has to be paid for high efficacy of the therapy in terms of health and survival.

## 5. Male sexuality – health and pathology

Sexuality is an immanent trait of every human. It is universal and dynamic in nature, as it changes with an individual's growth and experience. A complex structure of sexuality is shown in Seligman's model (Fig. 1). It distinguishes five layers: sexual identity; sexual orientation; sexual preferences; sex role; and sexual performance.

The order of the layers suggest a growing importance of psychological factors and declining importance of biological ones in determining particular levels. The model has significant practical implications as it indicates predisposition to change of particular structures and efficacy of medical and psychological impacts. The deeper the structure and the larger share of biological factors in its functioning, the stronger resistance to change and the more significant role of medical rather than psychological interventions. And the other way round: more superficial layers – determined, in most part, by

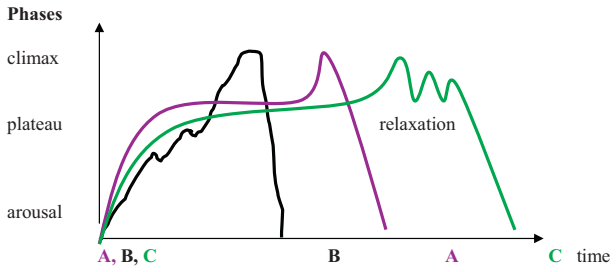


**Fig. 2 – Male sexual response reaction cycle according to Masters and Johnson's model.**

***Source*: based on Masters and Johnson (1975).**

psychological agents – offer a greater chance for a change to be induced by psychological methods.[4]

Testicular cancer may lead to changes in the area of sexual expression when treatment is accompanied by disorders in physiologically and psychologically conditioned sexual functioning, and that of sex roles when extensive side effects restrict the activity which is socially and culturally attributed to men.

Male sexual expression and sex roles involve the following important aspects: (1) sense of masculinity; (2) sense of being attractive for the opposite gender; (3) sexual drive; (4) phases of sexual response cycle (arousal, erection, ejaculation and climax [Fig. 2]; (5) sexual satisfaction.[5] Each of them may feature dysfunctions as biological and psychological consequences of cancer diagnosis and treatment.

Correct male sexual expression is conditioned by the anatomical structure and functioning of the sexual organs, the functioning of the circulatory and nervous systems, hormonal balance and psychological factors.[6]

## 6. Sexual functioning of testicular cancer survivors – review of English language literature

### 6.1. *Testicular cancer survivors vs. whole population*

Retrospective study by Rieker et al.[7] indicated that testicular cancer survivors experienced a more severe distress, as compared to the total population, with regard to objective dimension of sexual functioning: ejaculation disorders (24% vs. 1%), erection disorders (10% vs. 3%), while exhibiting no significant differences in subjective dimension of sexuality: sexual desire (11% vs. 8%) and sexual satisfaction (12% vs. 13%). Higher risk of infertility and sexual dysfunctions occurred in men after chemotherapy and RLND. This study gave rise to a series of investigations into TC survivors' sexual functioning with different treatment modalities.

### 6.2. *Radiation therapy and sexuality of seminoma patients*

Tinkler et al.[8] analysed sexuality of seminoma patients treated with radiation therapy. Compared to a control group, they showed reduced libido, difficulties in maintaining erection ($p = 0.0013$), lower intensity of orgasm, and reduction of semen. No differences in ejaculation and sexual satisfaction were found, which is interesting considering other disorders in this area. This may be accounted for by a reduced libido in that group. The study found a significant difference in the frequency of sexual intercourses ($p = 0.03$), interest in sex ($p = 0.005$), ability to maintain erection ($p = 0.005$) and amount of semen ($p = 0.01$) in patients aged below 35 years, as compared to older ones, with younger patients performing better. Age is then a factor of significant importance to sexual functioning both in healthy and diseased population; it worsens the side effects of treatment.

### 6.3. *Chemotherapy and sexual functioning*

The toxicity of chemotherapy depends on the dose of cytostatics. Larger amounts of medicines and longer treatment is associated with higher probability of disorders in various bodily functions. Treatment involving two courses of adjuvant chemotherapy (BEP or PVB protocols) does not often lead to major or permanent sexual dysfunctions.[9] However, chemotherapy with larger number of courses and higher doses of medicines carries the risk of sexual disorders in patients with testicular cancer of higher clinical stage. Van Basten[10] reported reduced libido, decline in sexual arousal, erection and ejaculation disorders, lower intensity of orgasm and lower volume of semen in patients treated with chemotherapy, as compared to patients managed with orchiectomy alone. Absence of ejaculation was observed to be the only dysfunction related to a specific treatment modality, i.e. post-chemotherapy resection of retroperitoneal residual tumour masses (RRRTM). This applied to as much as 25.6% of the group.

#### 6.3.1. *Chemotherapy with regard to sexual dysfunctions and treatment-induced angiopathy and neuropathy*

The same study[10] posed a hypothesis of angiopathic background of Raynaud's phenomenon[1] and lack of erection. Raynaud's phenomenon was found in 32.7% of the chemotherapy group. Much more patients affected with that condition reported erection problems (28.85%) than did those not affected (8.4%; $p < 0.05$). The hypothesis was verified by the same research team in a later longitudinal study on 21 men. Ten of them had undergone chemotherapy according to the BEP protocol (4 courses), the other 11, after orchiectomy alone, made up a control group. Results of Doppler ultrasound did not show any differences between both groups in terms of blood flow in the corpora cavernosa.[11] With this hypothesis unconfirmed, other organic and psychological factors behind TC survivors' dysfunctions had to be looked for.

[1] Toxicity of chemotherapy manifests itself, among other symptoms, by vascular and neurological complications. The former takes the form of Raynaud's syndrome, i.e. peripheral ischemia causing discolouration and finger and toe pains induced by low temperature or strong emotions, followed by the sensation of heat and redness. The latter, peripheral paresthesia, involves a damage to peripheral nerves in the region of the palms and feet causing numbness, tingling or pain.

## 7. Sexual functioning with regard to various treatment modalities – psychological factors

Jonker-Pool et al. pointed at the direct and indirect role of psychological factors in the occurrence and intensity of sexual dysfunctions in testicular cancer survivors.[12] They analysed the sexual function in the context of various treatment modalities. They found that 22.5% of patients treated with orchiectomy experienced at least one type of sexual disorders, even though orchiectomy is the least invasive of all testicular cancer treatment procedures. A relatively large proportion of patients after radiotherapy reported decline in libido and sexual activity (22% each), but this was not likely to be caused by a low level of testosterone. Furthermore, erection disorders occurring in only 14.5% of patients imply that a massive damage to coronary vessels, that is organic factors, should be excluded. A statistically significant proportion of testicular cancer survivors treated with chemotherapy showed reduced libido (29.5%) and less intensive orgasm (28.5%). Surprisingly, a decline in libido, orgasm intensity and sexual activity in patients treated with both chemotherapy and RRRTM was found to be smaller than in those subjected to chemotherapy alone (a statistically insignificant difference). This can hardly be accounted for by biological and organic effects of treatment. It is psychological agents that might be of great relevance here.

Interestingly, despite sexual function being restricted, the decline in sexual satisfaction is very limited[12] or none at all, as compared to the total population.[13] Faced with a heavy emotional distress of a life-threatening disease, patients may reorient their priorities and values and thus change their perception of the disease. This may also be explained by the decline in libido and more intimacy in a relationship.

The study by Fegg et al.[13] indicates psychological implications of the disease and its treatment, such as anxiety over a failure to satisfy one's partner (22% of respondents) or inhibitions towards one's partner (9.6%), which may determine sexual functioning, along with physical conditions. Notably, changes in sexual functioning occurred immediately after diagnosis in 14.4% of patients; at the beginning of treatment in 13.8%; and after treatment in 65.1%, thus further confirming the importance of mental factors.

### 7.1. *New research direction: sexual dysfunction risk factors in testicular cancer survivors*

Longitudinal study on sexual functioning of testicular cancer patients treated with chemotherapy during the first year following orchiectomy was conducted by Tuinman et al.[14] It showed that marital status (single or committed) is a risk factor for sexual dysfunctions. The men who were single at the time of diagnosis reported more sexual problems than those in permanent relationships, except for sexual desire. Committed partners at the time of diagnosis experienced increased intimacy in their relationships, likely to act as a buffer protecting them against adverse emotions and consequences of the disease. Singles were deprived of that protective mechanism. Moreover, they could feel more afraid of infertility. The fear of infertility negatively affects sexual functioning and raises concerns over future intimate relations. It is also worth noting that singles have fewer sexual intercourses with more partners, hence different aspects of their sexuality are more difficult to evaluate. The lack or lower frequency of sexual activity may lead to reduced performance and artefacts.

Symptoms of clinical depression after chemotherapy were substantially more often observed in singles than committed partners. Depressive symptoms were related to erectile disorders, lower sexual satisfaction and overall deterioration of sexual functioning three months after orchiectomy. One year after testicle removal, depressive symptoms did not show any predictive value for sexual dysfunctions. Thus, they can be claimed to represent a risk factor only within several months following diagnosis.

## 8. Valuable information – meta-analyses

The results of meta-analysis made by Jonker-Pool[15] to examine sexual functioning for various treatment modalities were as follows:

- ejaculation dysfunctions – most prevalent type of sexual disorders – were linked with removal of retroperitoneal lymph nodes more than with any other medical procedure;
- erection dysfunctions, least prevalent of all disorders, were associated with radiotherapy;
- the occurrence of ejaculation and erection problems induced by objective physiological factors were mostly related to treatment modalities; psychological factors played a significant role for dysfunctions of subjective nature: decline in libido, reduction of orgasm intensity, sexual activity and satisfaction;
- sexual dissatisfaction was relatively low in relation to the overall number of sexual disorders.

Those results were reconfirmed by meta-analyses made by Rosendal[16] and Nazareth,[17] suggesting that testicular cancer patients can experience a variety of sexual, mostly short-term dysfunctions of organic or psychological origin.

The meta-analyses[15–17] revealed a diversity in study results in terms for variables used, treatment modalities, proportion of sexual dysfunctions (literature reports the loss of libido ranging from 2 to 69%, and ejaculation disorders ranging from 17 to 100%), as well as some methodological weaknesses: lack of control groups or use of unstandardised tools for variable measurements. Only few studies were actually suited for comparison.[17] For that reason, results of the meta-analyses should be approached with a lot of caution.

### 8.1. *Is the sexual function compromised in testicular cancer survivors? – references to meta-analyses*

The meta-analyses were responded to by a cross-sectional study[18] on a large sample of 1084 long-term survivors, comparing results with a control group and using a standardised tool for measuring the sexual function. It confirmed the results of the meta-analyses, i.e. the occurrence of ejaculation disorders in testicular cancer survivors and subjective aspects of sexuality independent from treatment modality: desire and sexual

satisfaction, as well as a relatively high rate of sexual satisfaction in relation to the rate of sexual dysfunction. At the same time, some differences in relation to the Jonker-Pool's study[15] were revealed: erection, the physiological sexual function, proved to be unaffected by treatment, while ejaculation disorder was found to be the only dysfunction dependent on a specific type of treatment, that is with chemotherapy, but not RLND. This may be due to the modification of RLND that has diminished the invasiveness of the procedure since the late 1980s.

It is worth noting that worse sexual functioning was correlated with neurotoxical side effects of (moderate), chronic post-treatment fatigue (significant), high anxiety according to the Hospital Anxiety and Depression Scale (HADS) (significant), lack of physical activity (moderate). Multivariate analysis showed older age, lack of permanent partner and elevated anxiety in persons affected with sexual problems. Ejaculation dysfunctions were in turn correlated with the absence of a permanent partner, chemotherapy and neurotoxicity of treatment.

## 9. Adolescents and young adults with testicular cancer – developmental approach

Carpentier,[19] after having reviewed 37 reports from 1980 to 2009, pointed at the deficiency of studies related to adolescents and young adults with diagnosed testicular cancer, even though the disease has its peak occurrence in the years of early adulthood, applying also to the age of adolescence. She proposed a developmental approach focused on developmental functions specific to those life stages, whose natural development can be disturbed by the disease and treatment. She also proposed a hypothesis that cancer of the testicle in adolescence and its accompanying changes of body self-image may disturb the natural emergence of sexual identity and consequent entry into sexual and romantic relationships. She stressed that being single at the time when the disease is recognised causes a specific vulnerability, which persists after the therapy is completed despite developing a relationship. The author highlighted the need to further explore the issue in the context of developmental functions of those age groups.

## 10. Sexual functioning of a couple following testicular cancer treatment – relational approach

### 10.1. *Long-term effects of testicular cancer treatment – perspective of a couple*

The study by Gritz[20] was the first one to look at the couple's sexual functioning following testicular cancer treatment. She initiated the relational approach to this research area. The study was of a cross-sectional design; it involved 34 couples, who had been married from the diagnosis to the study onset, meaning they had gone together through the cancer diagnosis and treatment processes. Testicular cancer treatment had a significant impact on the men's body self-image and sense of being attractive. Although most of the patients (64.7%) and their partners (88.2%) did not report any loss of attractiveness following treatment, more men (35.3%) felt less attractive than perceived by their partners (11.8%). The loss of attractiveness in some patients was of a long-term nature (23.5%), while the women perceived it as a short-term effect (11.8%), if any. This pattern of perceived attractiveness applied to all kinds of treatment modalities, except chemotherapy. Cisplatin-based treatment reduced patients' attractiveness for 70% of their female partners, that is more than in their own perception (60%). Researchers suggest that women support their partners by protecting them from their own reactions in the period of treatment and afterwards.

Sexual dysfunctions were mostly short lived, except for ejaculation problems. Notably, the change in the level of sexual satisfaction (47.1% of husbands and 54.9% of wives) meant a reduced satisfaction in 29.4% of the men and an increased satisfaction in 47.1% of the women. Nearly a half of the patients (47%) and 50% of their partners reported no changes in the frequency of sexual contacts. The remaining majority experienced a drop (38.2% of the men and 32.4% of the women) rather than rise in the number of sexual contacts. The frequency of sexual intercourses correlated positively with sexual satisfaction. Chemotherapy and radiotherapy distorted the couples' sexual functioning in a greater extent. The female partners more often avoided sexual intercourse after treatment (36.4% for orchiectomy, 23.1% for RLND, 50% for chemotherapy and 37.5% for radiation therapy) than perceived by their male partners (12.1% for orchiectomy, 23.1% for RLND, 10% for chemotherapy and 25% radiation therapy), which again exemplifies wives' protective attitude. The avoidance tendency was a short-term process.

The study by Gritz[20] and Hannah[21] on the same sample of patients demonstrated that cancer-induced disturbances in sexual and marital relationships are of minor and temporary nature. Most of the couples were able to go through the treatment and disease period, strengthening their mutual ties, trust, understanding, commitment and intimacy. A minority experienced more serious and long lasting problems.

### 10.2. *Couples in permanent relationships established before and after treatment – significant differences*

Tuinman[22] made a distinction between permanent relationships established before and after treatment, indicating differences between the two in terms of sexual and marital functioning. The difference applied only to male partners who had a relationship at the start of treatment. They experienced more sexual satisfaction than the men from the other group. Partners from both groups reported less sexual satisfaction than the control group. The results suggest a negative impact on sexual relationship in all persons affected by the disease (only female partners in relationships developed after treatment did not differ in terms of sexual satisfaction from the reference group). Of couples established before diagnosis, marital problems of clinical relevance were found in 12% of the men and as much as 22% of their spouses. A reverse tendency was observed in the couples who developed their relationships after treatment. A significantly more men (25%) than women (18%) experienced clinically relevant marital problems. The results endorse Carpentier's thesis[19] of specific

predispositions to sexual dysfunction in patients who are single at the time of treatment. There is a need for further study on men developing their intimate relationships after completion of testicular cancer treatment to identify potential threats and chances for their future partners.

## 11. Conclusion

The review of the English language literature reveals the complexity of the issue of men's sexual functioning after testicular cancer treatment. Sexuality, originally regarded as a unidimensional concept, has developed into a multidimensional systemic perspective. Various factors are analysed: biological, psychological and sociodemographic. Their constellations are examined to identify risk and protective factors for sexual disorders in TC survivors. Subgroups of men are distinguished and compared in respect of various development stages, their tasks and cancer-related threats for development.

Many of the described studies are limited by their methodological weaknesses involving the use of unstandardised tools for measuring sexual functioning[7–13] and lack of control groups.[9,13] Only few apply standardised questionnaires[14,18,22] and/or employ reference groups.[1,7,8,10–12,14,22] Prospective studies are still in short supply,[18,22] with cross-sectional investigations representing a vast majority. The above mentioned methodological drawbacks compromise the value and impede comparison of study results. Another difficulty lies in high diversity of studied groups as regards culture and sexuality, varied therapy standards and differences in availability of medical procedures. However, the methodological correctness of research grows with the level of complexity, delivering useful scientific evidence.

## 12. Potential directions of further study

The review of literature stresses the need for further study of sexual functioning in testicular cancer survivors in a multidimensional and systemic perspective, with due care taken of methodological aspects (standardised research tools, control group, prospective study, randomised selection of study subjects).

Potential directions of further research include:

- functioning of young adults and adolescents with testicular cancer in the context of developmental functions specific for this stage of life – developmental perspective;
- developmental approach to effects of testicular cancer and its treatment for men at different developmental stages;
- testicular cancer in homosexual couples;
- cultural background of sexual disorders (type, intensity);
- risk and protective factors before occurrence of sexual dysfunctions in a group of testicular cancer patients seen from a holistic perspective;
- short- and long-term effects of treatment and their background – longitudinal studies;
- mental and sexual functioning of TC survivors' partners;
- impact of a psychological intervention, social support[23] and music therapy[24] on the quality of life and sexual life in testicular cancer.

The above proposals illustrate the research potential, whereas its usefulness and a growing number of survivals[25] indicate practical benefits of new scientific findings.

## Appendix A.

| The study | The study design | Sample characteristics | Control sample | Instruments used | Standardised sexual function questionnaire |
|---|---|---|---|---|---|
| Rieker et al. (1989) USA | Cross sectional | 223 men;<br>RT – 32%<br>CT – 9%<br>RLND – 17%, CT + RLND – 33%;<br>RT + CT/RT + RLND – 9% | Yes,<br>120 men | Profile of Mood States (POMS);<br>an abbreviated form of the Cancer Patient Behavior Scale (CPBS)<br>Concealing Emotions Scale (CES)<br>Self-Report Questionnaire | No,<br>Self-Report Questionnaire designed specifically for the study |
| Tinkler et al. (1992) Great Britain | Cross sectional | 155 men;<br>ORCH – 18 men<br>ORCH + RT – 137 men | 121 men | Sexual function questionnaire-design specifically for the study | No,<br>sexual function questionnaire-designed specifically for the study |
| Böhlen et al. (2001) Switzerland | Cross sectional | 49 men;<br>CT – 2 cycles – 100% | No | Sexual function questionnaire-design specifically for the study | No,<br>sexual function questionnaire-designed specifically for the study |
| Van Basten (1997) The Netherlands | Cross sectional | 215 men;<br>ORCH – 26%<br>CT – 19.6%<br>CT + RRRTM – 54.4% | Yes;<br>the men treated with orchidectomy and surveillance as reference group | A self-report inventory-designed on items of the Intimate Bodily Contact Scale (IBSC) of Vennix and Groningen Arousability Scale (GAS) questionnaires | No,<br>a self-report inventory designed specifically for the study |
| Van Basten (1999) The Netherlands | Longitudinal | 21 men;<br>ORCH – 11 men<br>CT – 10 men. (4 cycles of BEP) | Yes;<br>the men treated with orchidectomy and surveillance as reference group | A self-report inventory-designed on items of the Intimate Bodily Contact Scale (IBSC) of Vennix and Groningen Arousability Scale (GAS) questionnaires;<br>Visual Erotic Stimulation Test (VES) | No,<br>a self-report inventory designed specifically for the study |

| The study | The study design | Sample characteristics | Control sample | Instruments used | Standardised sexual function questionnaire |
|---|---|---|---|---|---|
| Jonker-Pool (1997) The Netherlands | Cross sectional | 264 men;<br>ORCH – 22.5%<br>RT – 15.5%<br>CT – 16%<br>CT + RRRTM – 46% | Yes;<br>the men treated with orchidectomy and surveillance as reference group | A questionnaire designed specifically for the study | No,<br>a questionnaire designed specifically for the study |
| Fegg (2003) Germany | Cross sectional | 341 men;<br>ORCH – 19%<br>CT – 24.6%<br>CT + RRRTM – 56.4% | No | Questions on Life satisfaction (QLS); | No,<br>a Self-Report Questionnaire designed specifically for the study |
| Tuinman et al. (2010) The Netherlands | Longitudinal | 93 men;<br>ORCH – 26%<br>CT – 44%<br>CT + RRRTM – 30% | Yes,<br>109 men | International Index of Erectile Function (IIEF);<br>The Center for Epidemiological Studies-Depresion Scale (CES-D) | Yes,<br>International Index of Erectile Function – IIEF |
| Dahl et al. (2007) Norway | Cross sectional | 1084 men;<br>ORCH – 9%<br>RLND – 13%<br>RT – 46%<br>CT/CT + RRRTM – 32% | Yes,<br>the representative sample of Norwegian male population (2100 males in 2004 and 1394 in 2005) | The Hospital Anxiety and Depression Scale (HADS);<br>The Fatique Questionnaire (FQ);<br>The Brief Male Sexual Function Inventory – BSFI | Yes;<br>The Brief Male Sexual Function Inventory – BSFI |
| Gritz et al. (1989) USA | Cross sectional | 34 married couples | No | The structured interview-seven psychometric instruments administered as a part of the interview | No |
| Tuinman et al. (2005) The Netherlands | Cross sectional | 259 couples (relationships established before (85%) and after treatment (15%) | No | The Dutch version of the Maudsley Marital Questionnaire (MMQ) | Yes,<br>The Dutch version of the Maudsley Marital Questionnaire (MMQ) |

ORCH, orchidectomy; CT, chemotherapy; RT, radiotherapy; RLND, Retroperitoneal Lymph Node Dissection; RRRTM, resection of retroperitoneal residual tumour masses.

## Conflict of Interest

None declared.

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