# Surviving testicular cancer

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# chapter 7 **sexual function, depressive symptoms and marital status in testicular cancer patients: a longitudinal study**

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## Introduction

Testicular cancer is rare (1% of new cancer diagnoses in men), but the most frequent malignancy in young men aged between 15 and 40 years. The highest incidence lies around 30 years of age (1;2). Testicular cancer is highly curable, with approximately 85% of men surviving the disease (3). Sexual functioning in testicular cancer patients and survivors has received attention before. This is not surprising, as this type of cancer involves an organ associated with sexuality, and strikes at a young age when sexuality is of great importance. Testicular cancer patients can experience sexual problems after diagnosis and completion of treatment which can strongly affect global quality of life (4).

Two review studies on sexual functioning in men who were treated for and survived testicular cancer reported that a varying percentage of testicular cancer survivors suffered several physical sexual problems such as ejaculatory failure (29%-44%), orgasmic problems (10%-20%), and erectile dysfunction (approximately 10%) (5;6). According to more recent studies the prevalence of erectile dysfunction after testicular cancer is similar to that found in the general population (4;7). In addition to physical sexual problems, a considerable percentage of survivors also report psychosexual dysfunction after treatment like decreased desire (7%-20%), decreased sexual activity (9%-24%) and dissatisfaction (5%-20%). Sexual dysfunction was reported to persist for up to two years after treatment, after which functioning seems to recover (5;6). According to the reviews, the majority of studies on sexual functioning after testicular cancer have methodological shortcomings. Studies differ widely in variables included and outcomes measured, making comparison difficult. In addition, only a limited number of studies used standardized questionnaires, normative data or measured sexual functioning prospectively. A more recent study addressed sexual functioning in testicular cancer survivors and compared this to functioning in a norm group (8). Results indicated that survivors experienced more problems with sexual drive, erection and ejaculation than men in the norm group. However, young survivors (20-39 years) reported more sexual satisfaction than their normative counterparts. It remains unclear why some survivors develop and continue to have sexual problems, while others do not. It is therefore useful to gain insight to possible risk factors for the development of sexual dysfunction.

A possible risk factor might be type of treatment. Hormonal, vascular and nervous systems seem to be disturbed by chemotherapy which may result in sexual dysfunction. Men who underwent a retroperitoneal lymph node dissection (RPLND) after chemotherapy reported ejaculatory dysfunction. Fortunately, this negative side effect was considerably reduced since modification of RPLND techniques about 25 years ago into resection of residual retroperitoneal tumor mass only (RRRTM) (9). Psychosexual functioning appears to be reduced independently of type of treatment (5;10-13).

A second risk factor may be the relationship status of patients. In general, married men appear to experience a better quality of life than single men, and this might include sexual functioning as well (14). Since testicular cancer patients are relatively young, a significant

number will not yet have established a steady relationship and is therefore single. Most studies indicated that around 70% of participating testicular cancer survivors was in a committed relationship when diagnosed (15). A review study indicated that little attention has been paid to the effect of relationship status on functioning in testicular cancer patients and survivors (16). The few studies that addressed this subject showed that testicular cancer survivors in relationships established after completion of treatment reported less sexual satisfaction than men in the general population, and than testicular cancer survivors who had the same partner as at time of diagnosis (17). It was also found that testicular cancer survivors who did not have a partner were more likely to report sexual problems, defined by drive, erection and ejaculation problems, or a satisfaction problem compared to survivors who did have a partner (18). Contradictory to these findings was the finding that sexual functioning in testicular cancer patients was similar in men with a partner and singles. However, married men seemed somewhat more worried about changes in their appearance and attractiveness, and an earlier study found that 24% of married survivors perceived themselves to be less attractive as a result of their treatment (19;20). These contradictory findings make it of interest to take relationship status as a risk factor into account for sexual dysfunction.

A third risk factor may be depression. It has been suggested that the emotional impact of testicular cancer may be a more important predictor of sexual dysfunction than objective physical and treatment aspects (5;13). Psychological responses to diagnosis and treatment should therefore be taken into account when studying sexual functioning. However, very little attention has been paid to the relationship between emotional distress and sexual dysfunction in this group (6). Depressive symptoms are prevalent in cancer patients, with reported rates varying between 15%-24% (21;22). Depression appears to be prevalent in 9-11% of testicular cancer survivors up to 5 years after treatment completion (23) and is unrelated to age at diagnosis, type of treatment or marital status at diagnosis. Depression is well known to be related to sexual dysfunction, with the majority of (not cancer-related) depressed patients reporting sexual dysfunction. It is associated with decreased libido, decreased frequency of intercourse, erectile dysfunction and delayed or absent orgasm, independent from use of antidepressant drugs (24). A study on long-term testicular cancer survivors (median number of years since treatment 3.9) showed that severely impaired sexual functioning was related to more depression and fatigue (12).

To advance on existing research, the present two-center study focused on sexual functioning in testicular cancer patients during the first year after orchiectomy (removal of the affected testicle), using standardized questionnaires. The effect of relationship status, type of treatment and depressive symptoms on sexual functioning were taken into account. Main research aims were to examine:

- the trajectory of sexual functioning during the first year after removal of the affected testis
- differences in sexual functioning on the basis of type of treatment received and relationship status
- the effect of depressive symptoms on sexual functioning concurrently and prospectively.

## Methods

*Patients and procedure*

This study was part of a larger study on the possible negative effects of chemotherapy after testicular cancer. As chemotherapy is a treatment option after diagnosis of non-seminomatous testicular tumors, only patients with this diagnosis were included. Two patient groups diagnosed with a non-seminomatous testicular tumor were approached for participation. The first group consisted of all patients referred to the University Medical Center Groningen (UMCG) in The Netherlands for treatment between April 2001 and March 2004. Exclusion criteria were age younger than 18 years at study entry, a psychiatric illness or history involving formal thought disorders, insufficient command of the Dutch language, prior neurologic illness, and previous treatment for cancer. The study was approved by the Medical Ethics Committee of the University Medical Center Groningen. The second group consisted of all patients consecutively visiting the MD Anderson Cancer Center (MDACC) in Houston, Texas, United States of America for treatment between December 1999 and December 2002. The study was approved by the Institutional Review Board (IRB) of the MDACC. Exclusion criteria were age younger than 18 years at study entry, a psychiatric illness or history involving formal thought disorders, insufficient command of the English language, inability to give informed consent, prior neurologic illness, and an extragonadal germ cell tumor.

Orchiectomy is both therapeutic and diagnostic: a conclusive diagnosis of testicular cancer results from pathology assessment of the removed testicle. Therefore, the study was introduced to patients after orchiectomy in both institutions. Patients received oral and written information about the study from co-workers of the study, together with an informed consent form. Patients who agreed to participate, received a self-report questionnaire at three time points: after orchiectomy but before the start of chemotherapy (T1), immediately after chemotherapy completion or three months after T1 (T2), and one year after T1 (T3). At both hospitals T1 and T2 questionnaires were completed in the hospital. At the MDACC patients filled in the T3 questionnaire at the hospital as well, at the UMCG T3 questionnaire and a prepaid return envelope were sent to the patients' home address.

*Instruments*

Information on age, educational level, daily occupation, proposed type of treatment and relationship status ( dichotomized into the categories 'with a partner' (married or in a committed relationship) and 'single') were collected at T1. Daily occupation was dichotomized into the categories 'employed for wages' (including self employed) and 'not employed for wages' consisting of students, being unemployed, and being unable to work. On T3, information on type of treatment received was retrieved from the patients' medical files. Dutch educational level was measured on a 7-point scale: 'Elementary school' (1), 'Lower technical/vocational degree' (2), 'High school -low level' (3), 'Middle level technical/vocational

degree' (4), 'High school - high level' (5), 'Higher technical/vocational degree' (6), and 'University degree' (7). American educational level was measured on a 7-point scale also, using the following levels: 'Never received a high school diploma/GED' (1), 'High school diploma/GED' (2), 'Technical/vocational degree' (3), 'Some college level credits or 2 years college degree' (4), 'Bachelors degree' (5), 'Masters degree' (6), and 'M.D., Ph.D., or advance degree' (7). Because both countries measured education according to a 7-point scale, and higher scores indicated more years of education we treated education level as a continuous variable. Type of treatment consisted of orchiectomy only, orchiectomy and chemotherapy, or orchiectomy, chemotherapy and resection of residual retroperitoneal tumor mass. Patients of the UMCG group received four cycles of bleomycin, etoposide and cisplatin (BEP), with a three-week interval between each cycle. Chemotherapy regimen in the MDACC group ranged from 1 to 7 cycles, depending on stage, tumor markers, and response. BEP was the most commonly administered regimen, but several patients received CISCA/VB (cyclophosphamide, adriamycin, cisplatin, vinblastine, and bleomycin), or BOP (vincristine, bleomycin, and cisplatin)/CISCA/POMB (vincristine, methotrexate, and bleomycin) /ACE (etoposide, actinomycin, and cyclophosphamide). Strategies for treatment following chemotherapy are comparable at the UMCG and the MDACC. All patients with disseminated testicular cancer and residual disease after chemotherapy with masses > 1 cm on a CT scan underwent an exploratory laparatomy and resection of residual retroperitoneal tumor mass (RRRTM) (3). All patients with a mature component in the primary testicular tumor underwent an exploratory laparatomy as well to ensure that all potential metastatic disease was resected (25).

Sexual functioning was measured using the International Index of Erectile Function (IIEF), a widely used, multi-dimensional self-report instrument for the evaluation of male sexual function (26;27). The IIEF consists of 5 subscales: erectile function (6 items), orgasmic function (2 items), sexual desire (2 items), intercourse satisfaction (3 items), and overall satisfaction (2 items), and provides a total score (sum of all items). Normscores are available from 109 male volunteers (mean age 55 years, range 29-76) without a history of sexual dysfunction. Items were scored with different value labels on a five- or six-point scale, and 9 items were scored 0 when the patient had not been sexually active. A mean score for each subscale was calculated and higher scores indicated better functioning. Reliability of the IIEF in the UMCG group was good for all subscales (alphas ranged from 0.86 to 0.98 over the three measurement times). Reliability for the IIEF in the MDACC group was good for all subscales (alphas ranged from 0.86 to 0.95 over the three measurement times), except for the alpha for orgasmic function at T3 which was somewhat less good (0.69).

Depression was measured with the CES-D, a twenty-item questionnaire that measures depressive symptoms during the past week. Items are scored on a 4 point scale ranging from seldom or never [0], sometimes or a little [1], regularly [2], to most of the time or always [3]. Scores are summed, resulting in a possible total score ranging from 0 to 60. A score of 16 or

above suggests clinically significant depressive symptoms. The CES-D shows good internal validity and reliability (28), also in cancer patients (22). In the present study Cronbach's alphas for the UMCG group ranged from 0.89 – 0.91, and for the MDACC group from 0.88-0.91.

*Statistical analyses*

Independent measures t-tests and Chi-square test were performed to examine differences in sociodemographics and type of treatment between patient groups according to nationality and relationship status. The cut off score of the CES-D was used to identify patients who were experiencing clinically significant depressive symptoms. Repeated measures analyses of variance were computed to examine change over time in the five domains of sexual functioning and depressive symptoms; firstly with relationship status and secondly with type of treatment (3 groups) as between-groups factor. Relevant covariates were entered to control for differences between groups. Independent t-test were performed to examine differences between sexual functioning of respondents at T3 and that of the normgroup. Effect sizes were calculated using Cohen's d to assess the clinical significance of differences found over time and of comparison with norm. Effect sizes lower than .20 indicate negligible differences, effect sizes between .20 and .50 indicate a small difference, and those between .50 and .80 a moderate difference. A large effect size ($\geq$.80) can be seen as a clinically important difference (29).

Pearson correlations were used to examine relationships between sexual functioning and depressive symptoms, concurrently (within time, T1 depressive symptoms with T1 sexual functioning etc.) and prospectively (T1 depressive symptoms and T2 and T3 sexual functioning, controlling for T1 sexual functioning). By controlling for levels of the dependent variable at T1, inferences can be made about the direction of the causal influence.

## Results

*Population*

Of the 70 patients diagnosed with testicular cancer during the inclusion period in the Netherlands, 6 (8%) did not meet the inclusion criteria. Fifteen patients decided not to participate (response = 77%). After T1, 9 of the 49 (18%) patients dropped out of the study. Which means that complete data were available from 40 out of 64 eligible patients. At the MDACC, all patients with a possible diagnosis of testicular cancer (n=280) seen in the genitourinary clinic were systematically screened. Of these, only 100 were eligible based on our eligibility requirements. Other reasons include not being newly diagnosed, extragonadal primary, brain metastases, too old or young, bilateral tumors, and positive history of a major head injury. Seventy six patients consented to participate of whom 53 completed all assessments (response = 76%, 30% drop-out). In total, data of 93 patients were analyzed.

*Sociodemographic and treatment related variables*

Mean age of all patients at T1 was 29.4 years (standard deviation (sd) 7.5), ranging from 18 to 50 years. Educational level completed varied from primary school to advanced university degree, most patients (30%) had a technical vocational degree or some years of college. Of the patients, 74 (80%) were employed for wages. Of the 19 who were not, 14 were students, 3 were unemployed, and 2 were unable to work. At T3, twenty-four patients (26%) had been treated with orchiectomy alone, 41 (44%) with orchiectomy and chemotherapy, and 28 (30%) were treated with additional RRRTM. More than half of the patients were married or cohabiting, 39% was single. Singles appeared to be younger ($t = -4.0$, $p<.001$) and more often unemployed (Chi-square = 12.3, $p < .001$) than patients with a partner (Table 1).

*Preliminary analyses*

It may be that differences exist between Holland and the United States with respect to organization of health care, education and work as well as for social norms regarding dating behaviour and establishing relationships. Analyses showed that relationship status and employment status were comparable in the two countries. Minor differences were found with respect to age (UMCG patients were somewhat younger than MDACC patients ($t= -2.0$, $p <.05$)), educational level (MDACC patients finished higher levels of education ($Chi2 = 12.8$, $p<.05$)), and type of treatment (UMCG patients more often receiving additional abdominal surgery ($Chi^2 = 11.4$, $p<.01$)). Repeated measures analyses of variance with between subject factor nationality showed differences in erectile function ($F=6.2$, $p = .015$), sexual desire ($F=3.9$, $p=.049$), and overall satisfaction ($F=12.4$, $p=.001$) at some, but not all time points. There were no significant interactive effects of nationality and time. To account for these differences found and for other potential cultural covariates, a nationality variable was retained in subsequent analyses.

*Effect of time on sexual functioning*

Significant time effects were found on erectile function, orgasmic function, intercourse satisfaction, overall satisfaction and the total score. Inspection of the mean scores showed that levels of erectile function and intercourse satisfaction were comparable at T1 and T2, but higher at T3. Orgasmic function, overall satisfaction and the total score followed a positive quadratic trajectory, meaning that begin and end scores rise above the center point. Levels decreased between T1 and T2, and increased to an above T1 level at T3. Effect sizes of statistically significant changes over time were negligible indicating that changes were not clinically significant (Table 2).

*Effect of relationship status*

Repeated measures analysis of variance with between subjects factor relationship status and

**Table 1** Sociodemographics at T1 and type of treatment received at T3

| | M, N | SD, % |
|---|---|---|
| **Age** (years) | 29.4 | 7.5 |
| range | 18 - 50 | |
| **Educational level** | | |
| 1 | 3 | 3% |
| 2 | 14 | 15% |
| 3 | 12 | 13% |
| 4 | 28 | 30% |
| 5 | 23 | 25% |
| 6 | 9 | 10% |
| 7 | 4 | 4% |
| **Relationship status** | | |
| Single | 36 | 39% |
| Partner | 57 | 61% |
| **Employment status** | | |
| Employed for wages | 74 | 80% |
| Not employed for wages | 19 | 20% |
| **Type of treatment** | | |
| surgery | 24 | 26% |
| surgery + CT | 41 | 44% |
| surgery + CT +/- RRRTM*** | 28 | 30% |

* *t*-test: t = -2.0, p<.05
** Chi-square = 11.4, p<.01
*** CT = chemotherapy, RRRTM = resection of residual retroperitoneal tumormass

covariates age and employment status, indicated a significant group effect on erectile and orgasmic function, intercourse and overall satisfaction, and the total score but not on level of desire. Singles reported worse functioning than committed patients over the year. Effect size for the difference in intercourse satisfaction was small, and differences in the other domains were negligible (Table 2). There was a significant interactive effect of time and relationship status on sexual desire (F=7.4, p<.01) and overall satisfaction (F=7.3, p<.01), indicating that desire and overall satisfaction changed over time in different ways for single and committed patients. Inspection of the mean scores showed that singles reported higher levels of desire at T1 and T3 (not significant) than committed patients, and a comparable level at T2. Singles

**Table 2** Descriptives on sexual functioning and repeated measures analyses of time and group effects

| | T1 Mean (SD) | T2 Mean (SD) | T3 Mean (SD) | Effect | F | P | Effect size |
|---|---|---|---|---|---|---|---|
| **Erectile function** | 21.6 (9.7) | 21.1 (10.3) | 24.1 (7.9) | Time | 4.8 | .03 | .05 |
| | | | | Group: relationship status | 26.5 | .000 | .19 |
| | | | | Group: treatment | 0.9 | *ns* | |
| **Orgasmic function** * | 7.8 (3.5) | 6.9 (4.1) | 8.4 (3.0) | Time | 8.7 | .004 | .09 |
| | | | | Group: relationship status | 6.9 | .01 | .08 |
| | | | | Group: treatment | 2.1 | *ns* | |
| **Sexual desire** | 6.9 (1.9) | 6.8 (2.1) | 7.3 (1.7) | Time | 3.9 | *ns* | |
| | | | | Group: relationship status | 0.33 | *ns* | |
| | | | | Group: treatment | 1.4 | *ns* | |
| **Intercourse satisfaction** | 8.2 (5.7) | 7.9 (5.8) | 10.0 (5.0) | Time | 7.7 | .007 | .08 |
| | | | | Group: relationship status | 29.1 | .001 | .26 |
| | | | | Group: treatment | 1.2 | *ns* | |
| **Overall satisfaction** * | 7.7 (2.3) | 7.1 (2.2) | 7.9 (1.8) | Time | 10.7 | .002 | .12 |
| | | | | Group: relationship status | 10.2 | .002 | .10 |
| | | | | Group: treatment | 1.0 | *ns* | |
| **Total** * | 53.4 (19.0) | 50.3 (21.8) | 58.2 (16.0) | Time | 7.2 | .009 | 08 |
| | | | | Group: relationship status | 14.4 | .001 | .16 |
| | | | | Group: treatment | 2.0 | *ns* | |

* : quadratic
*ns*: not significant

experienced significantly lower overall satisfaction as compared to committed patients at all measurement times, with the difference being greatest at T1.

*Effect of treatment*

Repeated measures analysis of variance, with between subjects factor treatment, showed no significant group effect or interactive effect of group and time on any aspect of sexual functioning (Table 2).

## Comparison with norm at T3

One year after diagnosis, sexual functioning of patients did not differ from norms, except for one aspect: patients reported less overall satisfaction (t=2.8, p<.01) than norms (mean=8.6, sd=1.7). The clinical relevance of this difference appeared small according to the effect size (d=-0.4; 95% confidence interval, ci: -0.7 - -0.12). Patients in a committed relationship differed from norms only on intercourse satisfaction: patients reported more satisfaction (t=-2.2, p<.05) than norms (mean=10.6, sd=3.9). The clinical relevance of this difference appeared small according to the effect size (d=0.33; ci: 0.0 – 0.66). Singles reported worse erectile function (t=3.3, p<.01) than norms (mean=25.8, sd=7.6), less intercourse satisfaction (t=3.0, p<.01), and less overall satisfaction (t=2.6, p<.01). The clinical relevance of these three differences were moderate according to effect sizes (erectile function: d=-0.70, ci: -1.08 - -0.34; intercourse satisfaction: d=-0.74, ci:-1.1 - -0.36; overall satisfaction: d=-0.56, ci: -0.93- -0.19).

*Depressive symptoms and sexual functioning*

Depressive symptoms were highest at T1 (mean 11.6, sd 8.9) and decreased over time (T2: mean 9.9, sd 8.6; T3: mean 7.9, sd 7.8) (F=20.6, p<.001). The change over time was however negligible according to the effect size (0.18). At T1, 24 patients (26%) reported clinically significant depressive symptoms, at T2, 14 patients (15%), and at T3, 15 patients (16%) did. Pearson's product moment correlation coefficients between Times 1 and 2 (r=.58), Times 2 and 3 (r=.65), and Times 1 and 3 (r=.58) depressive symptoms were significant and strong. At T1, more single patients (44%) reported clinically significant depressive symptoms than committed patients (14%) (Chi2 = 10.7, p<.001), but percentages were not significantly different at T2 (11% and 18% resp.) and T3 (17% and 16% resp.). The percentages of patients reporting clinically significant depressive symptoms did not differ between the two treatment groups at T2 and T3 (treatment was similar for all patients at T1), or between nationalities.

At T1, depressive symptoms were negatively related to 4 of the 6 subscales of sexual functioning: weakly to erectile function (r=-.27, p<.01), sexual desire (r= -.22, p<.05) and the total score (r=-.29, p<.01), and moderately strongly to overall satisfaction (r=-.36, p<.001). At T2, depressive symptoms were negatively and moderately strongly related to overall sat-

**Table 3** Concurrent and prospective relationships between depressive symptoms and sexual functioning

| | Concurrent | | | Prospective | |
|---|---|---|---|---|---|
| CES-D | **T1** | **T2** | **T3** | **CES-D and T2 sexual functioning** | **CES-D and T3 sexual functioning** |
| | ***r*** | ***r*** | ***r*** | **Partial *r*** [#] | **Partial *r*** [#] |
| **Erectile function** | -.27** | -.20 | -.13 | -.02 | -.14 |
| **Orgasmic function** | -.19 | -.14 | -.03 | -.09 | -.01 |
| **Sexual desire** | -.22* | -.17 | -.06 | -.06 | .01 |
| **Intercourse satisfaction** | -.20 | -.13 | -.08 | -.02 | -.04 |
| **Overall satisfaction** | -.36*** | -.37*** | -.24* | -.03 | -.02 |
| **Total** | -.29** | -.24* | -.12 | .05 | -.06 |

*<.05, **<.01, *** p<.001
[#] controlled for T1 depressive symptoms

isfaction (r=-.37, p<.001), and negatively weakly to the total score (r=-.24, p<.05). At T3, one negative weak correlation was found between depressive symptoms and overall satisfaction (r=-.24, p<.05). No significant prospective effect was found of T1 depressive symptoms on T2 or T3 levels of sexual functioning (Table 3).

## Discussion

This longitudinal study focused on functional and psychological sexual functioning in testicular cancer patients during the first year after orchiectomy, and on possible differences in sexual functioning according to relationship status, treatment and depressive symptoms. It appeared that sexual functioning after testicular cancer fluctuates during the first year after orchiectomy, but type of treatment and depressive symptoms are no risk factors for sexual dysfunction. Singles did report more sexual problems than committed men.

Testicular cancer patients experienced changes in all aspects of sexual functioning, except in desire. Apparently, in this group of young male cancer patients, desire in sexual activity seems unaffected by the cancer experience, at least during the first year. The other aspects of sexual functioning changed over the year, but according to different patterns. Orgasmic functioning, overall satisfaction and total sexual functioning changed according to a u-shaped pattern. Patients reported decreased functioning 3 months after removal of the

affected testicle (which is the ending of chemotherapy cycles for 75% of patients), followed by an increase in sexual functioning to above baseline level one year after diagnosis. Erectile functioning and intercourse satisfaction were comparable directly following orchiectomy and 3 months later, and patients reported improvement to above baseline level after one year. When compared to norm scores, patients only reported less overall satisfaction. Clinical relevance of this decreased satisfaction appeared to be small. However, even though most aspects of functioning were comparable to that of a norm group, this finding may be a cause of concern as the norm group is an average of 25 years older.

The pattern of improvement to above baseline level has been reported before in a study on quality of life of testicular cancer patients, that also included emotional and sexual items (30). It is possible that physical complaints, psychological distress and recuperating from surgery negatively affected sexual functioning, and that functioning improved after the patient was treated and responding well and the immediate threat was over. A comparable pattern was found when testicular cancer survivors were asked to rate their psychological functioning at time of study, and in retrospect prior to treatment and six months after treatment (31). Apparently, both from a retrospective as well as prospective view, patients assess the months following end of treatment as most stressful. It must be noted that even though sexual functioning showed a decrease after treatment, the overall change over the year was not clinically significant according to effect sizes.

The present study showed that type of treatment was unrelated to sexual functioning, which is in line with previous studies on sexual functioning and quality of life of testicular cancer patients (5;7;11;13;16;32). However, in other studies testicular cancer patients reported worse functioning on various quality of life domains, like physical function and fatigue immediately after completion of chemotherapy (30;33). Perhaps increased underlying fatigue, which we did not include in the present study, can explain the decreased orgasmic functioning, overall satisfaction and total sexual functioning at 3 months after orchiectomy.

The current study showed that relationship status does play a role in explaining sexual functioning. Single testicular cancer patients reported worse sexual functioning over the year as compared to patients with a partner in all but one aspect, namely desire. Even though differences between single patients and those in a relationship were statistically highly significant, effect sizes indicated that the differences were not clinically significant. It is likely that single men have intercourse less frequently than committed men. Not being sexually active can result in lower scores in the IIEF on erectile functioning and intercourse satisfaction, and that can partly account for the difference between single and committed patients for these aspects. While the desire to be sexually active was the same in both groups (again underlining the idea that desire is unaffected by the experience with cancer), singles evaluated their actual functioning as worse. When compared to a norm group one year after surgery, singles also reported less overall satisfaction, worse erectile functioning, and less intercourse satisfaction. Effect sizes were on the verge of being clinically relevant for the latter two, suggest-

ing that functioning on these aspects is a problem for singles. Men in a steady relationship at time of diagnosis often experience increased intimacy with their partners (17;19;34), possibly buffering negative feelings and consequences of their treatment for testicular cancer. The finding that patients in a relationship reported more intercourse satisfaction than men in the norm group may reflect this increased intimacy. Singles might experience more insecurity about their physical functioning because they miss this intimacy of a relationship. A second factor that may explain the difference between single and committed patients might be fertility distress. Infertility is a main concern for testicular cancer patients and survivors, eventually affecting approximately 30% of survivors (35). Even though sperm banking is quite common before start of treatment, and infertility can be assessed only after trying to actively conceive for one year, concerns about infertility may haunt testicular cancer patients in the first year after diagnosis. The testes are associated with feeling strong and potent, and the possibility of reproductive failure seems to decrease the idea of a masculine identity (36;37). Concerns about possible infertility have been found to negatively affect sexuality and sexual functioning, especially in singles, who might question whether they will find a partner (36). The third possible risk factor for sexual dysfunction examined was depression. Depression was most prevalent directly following orchiectomy, with 26% suffering from clinically elevated levels indicating that they probably need professional care. Later on in the year this percentage dropped to 16 and is comparable to that found in an earlier study (31). Directly following orchiectomy, 44% of the singles reported clinically elevated levels of depressive symptoms as compared to 14% of patients in a relationship, later on in the year no differences were found. Being unmarried was also found to be a risk factor for elevated depressive symptoms in breast cancer patients (38). Single testicular cancer patients might lack the support a partner may offer during the most stressful period of their illness, as men have been found to usually draw the most support from their partner (39).

Shortly after orchiectomy, when depressive symptoms were most prevalent, depression and several domains of sexual functioning were found to be related. Men who experienced more depressive symptoms reported having more erectile dysfunction, less sexual desire, less overall satisfaction, and a lower overall sexual functioning directly following orchiectomy. However, three and twelve months later depressive symptoms were weakly related only to overall sexual functioning. Depressive symptoms also had no predictive power in later sexual functioning. Apparently, depressive symptoms are not a strong risk factor for sexual problems, at least, not in testicular cancer patients.

This study has some limitations. Firstly, no information was available on the functioning of patients who declined to participate. They may have been those who were functioning best or worst, the results may have been biased in either direction. Secondly, although nationality was controlled for in the analyses, it might be that differences in social norms between America and the Netherlands may influence participants' responses to the sexual functioning items. A larger study including patient groups from several countries can address cultural influences on sexuality after testicular cancer better than a two site study.

Major strengths of the study were however the use of a prospective study design, and the use of a standardized, well-validated measure of sexual function. Different designs of studies on sexual functioning generates different findings. It was found earlier that an assessment made by patients retrospectively indicated considerable sexual deterioration after surgery for benign prostatic disease, whereas a prospective assessment showed little impact (40), possibly due to recall bias of the respondents. It is also interesting that when testicular cancer survivors were asked to describe their baseline sexual functioning twice (firstly before start of treatment, secondly at time of study), they evaluated their baseline sexual functioning worse at time of study than they did before the diagnosis (31). This finding could not be supported by our prospective results, that mainly showed significant, but not clinically relevant deterioration.

The positive findings of this study was that sexual functioning appeared to have improved one year after orchiectomy and that the decreases found were not clinically relevant. Men in a relationship even reported more intercourse satisfaction than norms. The fact that patients in a relationship experienced similar functioning as the norm group consisting of much older men, and that single patients reported worse functioning than men in the norm group is reason for concern however. Earlier studies showed that impaired sexual functioning appears to remain prevalent in approximately 15% of long-term testicular cancer survivors (41). We found that one of the possible risk factors for sexual problems was being single. This knowledge could facilitate offering information and possible guidance to those who need it the most. Up to two thirds of testicular cancer patients still experience a strong need for information concerning sexuality and one fifth experienced a need for support on this matter, even longer after treatment (42). However, many men find talking about genitally-related health problems difficult (43). Health care workers should pay extra attention to single testicular cancer patients, as they appeared more vulnerable to experiencing sexual problems in the first year after diagnosis.

## Reference List

(1) American Cancer Society. American Cancer Society. Cancer facts and figures 2006. Available at: http:www cancer org/downloads/STT/CAFF2006PWSecured pdf 2006.

(2) Visser O, Siesling S, Van Dijck JAAM. Incidence of cancer in the Netherlands, 1999/2000. Eleventh report of the Netherlands Cancer Registry. Associoation of Comprehensive Cancer Centres 2000;Available at: http://www.ikcnet.nl/uploaded/bibliotheek/document/VIKC-Inc-2000-81-web.pdf.

(3) Sonneveld DJA, Hoekstra HJ, van der Graaf WT, Sluiter WJ, Mulder NH, Willemse PHB, Koops HS, Sleijfer DT. Improved long term survival of patients with metastatic nonseminomatous testicular germ cell carcinoma in relation to prognostic classification systems during the cisplatin era. Cancer 2001 April 1;91(7):1304-15.

(4) Fegg MJ, Gerl A, Vollmer TC, Gruber U, Jost C, Meiler S, Hiddemann W. Subjective quality of life and sexual functioning after germ-cell tumour therapy. British Journal of Cancer 2003;89(12):2202-6.

(5) Jonker-Pool G, van de Wiel HB, Hoekstra HJ, Sleijfer DT, van Driel MF, van Basten JP, Schraffordt Koops HS. Sexual functioning after treatment for testicular cancer—review and meta-analysis of 36 empirical studies between 1975-2000. Archives of Sexual Behavior 2001 February;30(1):55-74.

(6) Nazareth I, Lewin J, King M. Sexual dysfunction after treatment for testicular cancer. A systematic review. Journal of Psychosomatic Research 2001 December;51(6):735-43.

(7) Dahl AA, Fossa SD. Sexual functioning in long-term survivors of testicular cancer (TCSs). Journal of Clinical Oncology 2004 July 15;22(14):388S.
(8) Dahl AA, Bremnes R, Dahl O, Klepp O, Wist E, Fossa SD. Is the Sexual Function Compromised in Long-Term Testicular Cancer Survivors? European Urology 2007 March 1.
(9) Van Basten JPA, Hoekstra HJ, vanDriel MF, Koops HS, Droste JHJ, JankerPool G, vandeWiel HBM, Sleijfer DT. Sexual dysfunction in nonseminoma testicular cancer patients is related to chemotherapy-induced angiopathy. Journal of Clinical Oncology 1997 June;15(6):2442-8.
(10) Dahl AA, Bremnes R, Dahl O, Klepp O, Wist E, Fossa SD. Is the Sexual Function Compromised in Long-Term Testicular Cancer Survivors? European Urology 2007 March 1.
(11) Jonker-Pool G, van Basten JP, Hoekstra HJ, van Driel MF, Sleijfer DT, Schraffordt Koops H, van de Wiel HB. Sexual functioning after treatment for testicular cancer: comparison of treatment modalities. Cancer 1997 August 1;80(3):454-64.
(12) Rieker PP, Edbril SD, Garnick MB. Curative Testis Cancer-Therapy - Psychosocial Sequelae. Journal of Clinical Oncology 1985;3(8):1117-26.
(13) Van Basten JPA, van Driel MF, Hoekstra HJ. Objective and subjective effects of treatment for testicular cancer on sexual function. British Journal of Urology International 1999;84:671-8.
(14) Brennan J. Other people. In: Brennan J, editor. Cancer in context.New York: Oxford University Press; 2004. p. 91-145.
(15) Dahl AA, Mykletun A, Fosså SD. Quality of life in survivors of testicular cancer. Urologic Oncology: Seminars and Original Investigations 2005;23:193-200.
(16) Fleer J, Hoekstra HJ, Sleijfer DTh, Hoekstra-Weebers JEHM. Quality of life of survivors of testicular germ cell cancer: a review of the literature. Supportive Care in Cancer 2004;12:476-86.
(17) Tuinman MA, Fleer J, Sleijfer DT, Hoekstra HJ, Hoekstra-Weebers JEHM. Marital and sexual satisfaction in testicular cancer survivors and their spouses. Supportive Care in Cancer 2005 July;13(7):540-8.
(18) Dahl AA, Bremnes R, Dahl O, Klepp O, Wist E, Fossa SD. Is the Sexual Function Compromised in Long-Term Testicular Cancer Survivors? European Urology 2007 March 1.
(19) Gritz ER, Wellisch DK, Siau J, Wang HJ. Long-term effects of testicular cancer on marital relationships. Psychosomatics 1990;31(3):301-12.
(20) Pool G. Surviving testicular cancer : sexuality & other existential issues (thesis). University of Groningen, the Netherlands (available at http://irs ub rug nl/ppn/255787200) 2003.
(21) Deshields T, Tibbs T, Fan M, Taylor M. Differences in patterns of depression after treatment for breast cancer. Psycho-Oncology 2006;15(5):398-406.
(22) Hahn D, Winter K, Jacobsen P. Measurement of depressive symtpoms in cancer patients: evaluation of the center for epidemiological studies depression scale (CES-D). Journal of Psychosomatic Research 1999;46(5):437-43.
(23) Dahl AA, Haaland CF, Mykletun A, Bremnes R, Dahl C, Klepp O, Wist E, Fossa SD. Study of anxiety disorder and depression in long-term survivors of testicular cancer. Journal of Clinical Oncology 2005 April 1;23(10):2389-95.
(24) Michael A, O'Keane V. Sexual Dysfunction in Depression. Human Psychopharmacology 2000;15:337-45.
(25) Sonneveld DJA, Sleijfer DT, Koops HS, Keemers-Gels ME, Molenaar WM, Hoekstra HJ. Mature teratoma identified after postchemotherapy surgery in patients with disseminated nonseminomatous testicular germ cell tumors - A plea for an aggressive surgical approach. Cancer 1998 April 1;82(7):1343-51.
(26) Rosen RC, Riley A, Wagner G, Osterloh IH, Kirkpatrick J, Mishra A. The international index of erectile function (IIEF): A multidimensional scale for assessment of erectile dysfunction. Urology 1997 June;49(6):822-30.
(27) Rosen RC, Cappelleri JC, Gendrano N. The International Index of Erectile Function (IIEF): a state-of-the-science review. International Journal of Impotence Research 2002 August;14(4):226-44.
(28) Bouma J, Ranchor AV, Sanderman R, Sonderen van E. Measuring depressive symptoms with the CES-D. A manual [Het meten van symptomen van depressie met de CES-D. Een handleiding.]. online report 1995;http://coo.med.rug.nl/nch/assessment1.htm#CES.
(29) Middel LJ. Assesment of change in clinical evaluation. University of Groningen, available at: http://dissertations ub rug nl/faculties/medicine/2001/l j middel 2001.
(30) Fossa SD, De Wit R, Trevor Roberts J, Wilkinson PM, De Mulder PHM, Mead GM, Cook P, De Prijck L, Stenning S, Aaronson NK, Bottomley A, Collette L. Quality of life in good prognosis patients with metastatic germ cell cancer: a prospective study of the European Organization for Research and Treat-

ment of Cancer Genitourinary Group/Medical Research Council Testicular Cancer Study Group (30941/TE20). Journal of Clincial Oncology 2003;21(6):1107-18.
(31) Gritz ER, Wellisch DK, Landsverk JA. Psychosocial sequelae in long-term survivors of testicular cancer. Journal of Psychosocial Oncology 1988;6(3/4):41-63.
(32) Fleer J, Hoekstra HJ, Sleijfer DTh, Tuinman MA, Klip EC, Hoekstra-Weebers JEHM. Quality of life of testicular cancer survivors and the relationship with sociodemographics, cancer-related variables and life events. Supportive Care in Cancer 2006;14(3):251-9.
(33) Fleer J, Sleijfer DTh, Hoekstra HJ, Tuinman MA, Hoekstra-Weebers JEHM. Prevalence, changes in, and correlates of fatigue the first year after diagnosis of testicular cancer. Anticancer Research 2005;25:4647-54.
(34) Hannah MT, Gritz ER, Wellisch DK, Fobair P, Hoppe RT, Bloom JR, Sun G, Varghese A, Cosgrove MD, Spiegel D. Changes in marital and sexual functioning in long-term survivors and their spouses: testicular cancer versus Hodgkin's disease. Psycho-Oncology 1992;1:89-103.
(35) Richie JP, Huyghe E, Matsuda M, Daudin C, Chevreau JM, Bachaud P, Plante L, Bujan L, Thonneau P. Fertility after testicular cancer treatments. Results of a large multicenter study. Cancer 2004;100:732-7.
(36) Gurevich M, Bishop S, Bower J, Malka M, Nyhof-Young J. (Dis)embodying gender and sexuality in testicular cancer. Social Science & Medicine 2004;58(9):1597-607.
(37) Van Basten JPA, Jonker-Pool G, van Driel MF, Sleijfer DTh, van de Wiel HB, Mensink HJA, Schraffordt Koops HS, Hoekstra HJ. Fantasies and facts of the testes. British Journal of Urology 1996;78:756-62.
(38) Bardwell WA, Natarajan L, Dimsdale JE, Rock CL, Mortimer JE, Hollenbach K, Pierce JP. Objective cancer-related variables are not associated with depressive symptoms in women treated for early-stage breast cancer. Journal of Clinical Oncology 2006;24(16):2420-7.
(39) Reevy GM, Maslach C. Use of social support: Gender and personality differences. Sex Roles 2001 April;44(7-8):437-59.
(40) Fichten CS, Libman E, Amsel R, Creti L, Weinstein N, Rothenberg P, Liederman G, Brender W. Evaluation of the sexual consequences of surgery: retrospective and prospective strategies. Journal of Behavioral Medicine 1991;14(3):267-85.
(41) Vidrine DJ, Gritz ER. Psychosocial outcomes after testicular cancer treatment. In: Steele jr. GD, Phillips TL, Chabner BA, Gansler TS, editors. Germ cell tumors - American Cancer Society Atlas of clinical oncology.Hamilton, London: BC Decker Inc.; 2003. p. 295-305.
(42) Jonker-Pool G, Hoekstra HJ, van Imhoff GW, Sonneveld DJA, Sleijfer DT, van Driel MF, Schraffordt Koops H, van de Wiel HBM. Male sexuality after cancer treatment - needs for information and support: testicular cancer compared to malignant lymphoma. Patient Education and Counseling 2004 February;52(2):143-50.
(43) Nobis R, Sand I, Elofsson K. Masculinity and urogenital cancer: sensitive issues in health care. Contemporary Nurse 2007;24(1):79-88.