ORIGINAL ARTICLE

Study of Sexual Functioning Determinants in Breast Cancer Survivors

Justine J. Speer, PhD, RN, FAAN,* Bruce Hillenberg, PhD,† Dennis P. Sugrue, PhD,‡ Charla Blacker, MD,§ Cynthia L. Kresge, BHS, PA,¶ Veronica B. Decker, CNS, MS, RN,# Dana Zakalik, MD,¶ and David A. Decker, MD#

**William Beaumont Research Institute, Royal Oak, Michigan; †William Beaumont Rose Cancer Center, Royal Oak, Michigan; ‡University of Michigan Medical School, Ann Arbor, Michigan; §Henry Ford Health System, Detroit, Michigan; ¶Cancer Care Associates, PC, Royal Oak, Michigan; and #William Beaumont Hospital, Royal Oak, Michigan*

■ **Abstract:** Our goal was to identify the treatment, personal, interpersonal, and hormonal (testosterone) factors in breast cancer survivors (BCSs) that determine sexual dysfunction. The treatment variables studied were type of surgery, chemotherapy, radiation, and tamoxifen. The personal, interpersonal, and physiologic factors were depression, body image, age, relationship distress, and testosterone levels. A sample of 55 female breast cancer survivors seen for routine follow-up appointments from July 2002 to September 2002 were recruited to complete the Female Sexual Functioning Index (FSFI), Hamilton Depression Inventory (HDI), Body Image Survey (BIS), Marital Satisfaction Inventory-Revised (MSI-R), a demographic questionnaire, and have a serum testosterone level drawn. The average time since diagnosis was 4.4 years (SD 3.4 years). No associations were found between the type of cancer treatment, hormonal levels, and sexual functioning. BCS sexual functioning was significantly poorer than published normal controls in all areas but desire. The BCSs' level of relationship distress was the most significant variable affecting arousal, orgasm, lubrication, satisfaction, and sexual pain. Depression and having traditional role preferences were the most important determinants of lower sexual desire. BCSs on antidepressants had higher levels of arousal and orgasm dysfunction. Women who were older had significantly more concerns about vaginal lubrication and pain. Relationship concerns, depression, and age are important influences in the development of BCS sexual dysfunction. The relationship of testosterone and sexual dysfunction needs further study with larger samples and more accurate assay techniques. ■

Key Words: body image, breast cancer, depression, relationship, sexual functioning, testosterone

There is growing evidence that women treated for breast cancer with surgery and chemotherapy commonly experience disturbances in sexual functioning. Over the past 20 years, studies have found that breast cancer, chemotherapy, or endocrine treatment have had a negative effect on the sex life of breast cancer survivors (BCSs) (1–4). Research reveals that sexual problems among women treated for breast cancer appear to be much more prevalent when patients have received chemotherapy, regardless of the type of surgery (5). The most frequent sexual problems reported have included diminished sexual desire, decreased arousal and lubrication, painful intercourse, and inhibited orgasm (6,7). Sexual problems can occur in patients who have been treated recently and in patients treated many years before (8). When survivors finish treatment they begin to realize the lasting impact that the diagnosis of cancer and it's subsequent treatment may have had on their sexual functioning (9–12).

Despite the prevalence of sexual dysfunction among BCSs, investigators have been unable to identify the most important relationships between medical treatments and the patients' physiological and psychosocial characteristics. For example, chemotherapy has an adverse impact on the ovaries' production of testosterone, which is assumed to cause a decrease in sexual desire in females. Psychosocial factors (e.g., mood, relationship quality with partner, body image) have been assumed to influence the sexual performance of breast cancer patients, but the evidence is not definitive. Medical science needs to identify the causes of different kinds of sexual problems BCSs experience in order to develop physiological and psychosocial interventions that will help patients and their partners sustain the quality of their sexual relationship.

Knowing how cancer and its treatment affect sexuality requires a multidimensional approach. Sexuality is a

Address correspondence and reprint requests to: Justine J. Speer, PhD, FAAN, 3601 West Thirteen Mile Rd., Royal Oak, MI 48073-6769, USA, or e-mail: jspeer@chartermi.net.

biopsychosocial experience that cannot be explained by studying patients' biologic/hormonal, interpersonal, or psychological experiences alone. Ganz et al. (13) found that having a new partner, positive mental health, and good body image explained 33% of the subjects' level of sexual interest. Vaginal dryness, having had chemotherapy, and having a new partner explained 33% of the variance in sexual dysfunction, while the quality of the relationship and the presence of partners' sexual problems explained 27% of the sexual satisfaction scores. In their analysis, the authors demonstrated that sexual functioning is not a unitary concept, but one that has different dimensions that are influenced by medical treatments and certain personal, physiological, and interpersonal factors.

The purpose of this study was to investigate how testosterone levels, mood, body image, depression, relationship quality, and age influence the sexual function of female BCSs who have been treated with surgery, radiation, chemotherapy, or adjunctive hormone therapy.

MATERIALS AND METHODS

A convenience sample of 55 female BCSs who had no evidence of recurrent disease was studied. Patients were included if they had completed their initial breast cancer therapy (surgery, radiation therapy, or chemotherapy). If the patients had completed their initial therapy but were continuing on adjuvant hormonal therapy (i.e., tamoxifen), they also were recruited for the study. Patients, irrespective of sexual functioning status, were recruited at well-patient follow-up appointments between July 2002 and September 2002. Recruited BCSs were asked to complete the study questionnaire and provide a blood sample for testosterone assay. All patients signed an informed consent form approved by the Human Investigation Committee. After the informed consent was signed, each subject had blood drawn, completed the Hamilton Depression Inventory—Revised (HDI-R), Body Image Scale (BIS), Female Sexual Functioning Index (FSFI), Marital Satisfaction Inventory—Revised (MSI-R), and a demographic questionnaire.

The HDI assesses the severity of physical, cognitive, and interpersonal symptoms associated with depression. This 17-item self-report measure assumes a fifth grade reading level, uses multiple questions to obtain item scores, and provides a sensitive measure of the severity of depression. The instrument asks the subject to indicate how he or she has been feeling over the past 2 weeks. The instrument has excellent reliability, test-retest reliability, and validity (14). The manual defines scores above the 94th percentile (a T-score greater than 67, a raw score greater than 18) as clinically depressed; high scores mean more severe depression.

The 10-item BIS (15), developed in collaboration with the European Organization for Research and Treatment of Cancer (EORTC), is a unidimensional scale used to measure body image changes in breast cancer patients. Possible scores range from 0 (good) to 30 (poor).

The MSI-R is a 150-item self-report measure of marital distress (16). There are 2 validity scales, 1 global distress scale, and 10 scales that measure specific aspects of the relationship. The scales measure dissatisfaction with affection, ability to resolve differences, amount of intimidation or aggression, lack of shared interests, finances, quality or frequency of the sexual relationship, relationships with the family of origin, role orientation, relationships with their children, and child rearing. A high score for all scales except role orientation means a high level of dissatisfaction or distress. A high role orientation score indicates a strong preference for nontraditional family roles, where decision making, child care responsibility, and work outside the home are shared. The MSI-R scale correlates well with established marital adjustment scales, differentiates between known healthy and distressed populations, and distinguishes changes in the distress of couples in marriage therapy.

Preliminary analysis revealed some MSI-R scales were highly interrelated. The study sample MSI-R data were factor analyzed using principal component analysis with varimax rotation with Kaiser normalization in order to reduce the number of variables. Three factors were identified. The first factor included seven scales (global distress, affective communication, problem-solving communication, aggression, time together, disagreement about finances, and sexual dissatisfaction). Three subscales (global distress, affective communication, problem solving) that had the highest loadings (greater than 0.71) on the first factor were used to construct a new variable called relationship distress, used in this study. Relationship distress scores ranged from 2 to 59, with a mean of 17.7 (13.2 SD).

The FSFI (17) is a paper and pencil test that has six subscales and a summation score that measure subjects' level of desire, arousal, lubrication, orgasm, satisfaction, and pain (dyspareunia). Subscale items are averaged and summed to get a weighted total score. Scores can range from 2.0 to 36. Higher scores mean better levels of sexual functioning.

Testosterone is an important component of female sexuality that is thought to influence desire. Surgically menopausal women and possibly chemically menopausal

Table 1. Sample Characteristics

Age (years)	
40–49	17 (29.3%)
50–59	27 (46.6%)
60–69	11 (18.9%)
Age range	41–69 years
Age (mean ± SD)	53.4 ± 6.6
Education	
High school	11 (20.7%)
1–2 years of college	10 (20.7%)
3–4 years of college	9 (15.5%)
>5 years of college	25 (43.1%)
Demographics	
Caucasian	55 (100.0%)
Married	52 (94.8%)
Stage at presentation	
I	22
IIA	17
IIB	11
IIIA–C	5
Lumpectomy/mastectomy	24/30
Body image score (mean ± SD)	6.7 ± 7.0

women or women who are receiving estrogen replacement therapy are likely to experience testosterone deficiency. Symptoms of testosterone deficiency include loss of libido, changes in motivation, lack of well-being and persistent fatigue. Although there is no laboratory definition of testosterone deficiency, testosterone-deficient patients have sufficient plasma estrogen levels and low circulating bioavailable testosterone. Current laboratory measures include total testosterone, sex hormone binding globulin (SHBG), free androgen index, and dehydroepiandrosterone sulfate (DHEA-S) level. The biochemical definition of testosterone deficiency is not well established, but a small total testosterone/SHBG ratio or free testosterone in the lower third of the female reproductive range is considered clinically abnormal (18). Lacking better measures of testosterone deficiency for this study, testosterone levels of the subjects were examined using either free testosterone or total serum testosterone assays. The normal range for free testosterone in postmenopausal women is 0.02–0.18 pg/ml. The normal range for total serum testosterone is 14–76 ng/dl.

RESULTS

Characteristics of Study Population

The sample was predominately well-educated, married, white, female BCSs between the ages of 41 and 69 years (Table 1). The average survivor had received treatment 4–8 years prior to the survey. The length of time since treatment ended ranged from 3 months to 16 years. The majority (n = 42) were in American Joint Committee Cancer stages I and IIA. Approximately 10% of the subjects in this study were clinically depressed according to standards in the HDI manual. The average body image score was high (mean 6.7; SD 7.0).

The means and standard deviations of the subjects' MSI-R scales were compared with samples used as "known" groups in the manual. The first "known" symptomatic group was a sample (n = 100) seeking marital therapy. Analysis showed BCSs to be significantly less distressed than couples in marriage therapy in all areas except satisfaction with their sexual relationship (Table 2). The survivors' concerns about their sexual relationships were very similar to the level of concern of the couples in marriage therapy.

Table 2. Comparison of Mean MSI-R Scores for BCSs with Couples in Marital Therapy and Community Couples (16) Not in Therapy[a,b]

MSI-R score	BCPs (mean ± SD) (n)	Couples in marital therapy (mean ± SD) (n)	Matched community (mean ± SD) (n)
Global distress	49.7 ± 8.2 (54)	64.9 ± 6.9*** (100)	47.4 ± 7.8 (154)
Affective communication	50.0 ± 8.2 (54)	61.3 ± 7.7*** (100)	47.6 ± 8.7 (154)
Problem solving	50.3 ± 8.0 (54)	62.5 ± 7.8*** (100)	47.3 ± 9.4* (154)
Aggression	45.8 ± 6.4 (54)	56.9 ± 10.3*** (100)	49.8 ± 9.3** (154)
Time together	48.6 ± 9.4 (54)	60.1 ± 8.2*** (100)	49.1 ± 8.9 (154)
Disagreement about finances	46.3 ± 8.8 (54)	57.4 ± 10.6*** (100)	50.3 ± 8.9** (154)
Sexual dissatisfaction	53.0 ± 10.6 (54)	56.3 ± 10.3 (100)	49.4 ± 9.6* (154)
Role orientation	52.7 ± 9.4 (54)	54.0 ± 7.3 (100)	50.4 ± 9.0 (154)
Family history of distress	50.4 ± 11.2 (54)	54.6 ± 9.6* (100)	49.3 ± 9.3 (154)
Dissatisfaction with children	44.6 ± 8.5 (45)	54.6 ± 11.3*** (78)	49.4 ± 10.1** (122)
Conflict over child rearing	47.0 ± 9.0 (45)	57.9 ± 11.2*** (78)	48.3 ± 7.5 (122)

[a]From the *Manual for the Marital Satisfaction Inventory*, revised. Western Psychological Services, 1997:58. Reprinted by permission of the publisher and available in chart and transparency form from Western Psychological Services, 12031 Wilshire Blvd., Los Angeles, CA, 90025, USA. Not to be reprinted in whole or in part for any additional purpose without the expressed, written permission of the publisher. All rights reserved.

[b]Significance of mean differences between BCP study sample and respective populations used in validity studies designated by *p = 0.05, **p = 0.01, ***p = 0.001.

Table 3. Comparison of FSFI Scores of Breast Cancer Survivors and Patients with Sexual Disorders and Normal Controls (17)

Domain	Female sexual arousal disorder (mean ± SD) (*n*)	Controls (mean ± SD) (*n*)	BCP (mean ± SD) (*n* = 55)
Desire	4.7 ± 2.12 (127)	6.9 ± 1.89*** (131)	4.62 ± 2.02
Arousal	9.7 ± 4.78*** (127)	16.8 ± 3.62*** (130)	12.56 ± 5.88
Lubrication	10.9 ± 5.48* (127)	18.6 ± 3.17*** (130)	12.87 ± 6.29
Orgasm	7.1 ± 4.08*** (128)	12.7 ± 3.16*** (129)	9.75 ± 4.85
Satisfaction	8.2 ± 3.59* (127)	12.8 ± 3.03*** (130)	9.58 ± 4.02
Pain	10.1 ± 4.64 (128)	13.9 ± 2.79*** (130)	10.53 ± 5.29
Total weighted score	19.2 ± 6.63** (126)	30.5 ± 5.29*** (129)	22.34 ± 8.9

*p < 0.05, **p < 0.01, ***p < 0.001.
From Rosen R, Brown R, Heiman J, et al. The female sexual function index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther* 2000;26:191–208. Reproduced by permission of Taylor & Francis, Inc.; http://www.taylorandfrancis.com.

Table 4. Relationship of Variables to Sexual Functioning (Pearson Correlation Coefficient) (*n* = 55)

Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total
Depression	−0.31*					
Role orientation	0.29*					
Relationship distress		−0.40**	−0.43**	−0.37**	−0.55**	−0.40**
Body image					−0.29*	
Testosterone (free/serum)						
Age						−31*

*p < 0.05, **p < 0.01.

The second known control group was a matched sample of couples who were not in therapy (Table 2). The BCSs were very similar to the normal community group (*n* = 154) in almost all marital satisfaction areas. However, survivors had significantly greater concerns about their problem-solving ability and their sexual relationship than did the normal controls. In summary, the BCS subjects were generally a normal population who were quite satisfied with their marital relationships but were concerned about their sexual functioning and problem-solving processes.

The BCSs in our study were compared with a sample used in a validity study of the FSFI, a "known" group of women with sexual arousal disorders seeking therapy (17). Table 3 shows that BCSs were similar to the "known" symptomatic sexual dysfunction group in their complaints about decreased desire and sexual pain. However, the BCSs had significantly poorer sexual functioning in every area of sexual functioning (desire, arousal, lubrication, orgasm, satisfaction, and pain) than the normal control group described in the article. Therefore the survivors in this study had poorer sexual functioning than normals, but better functioning than women receiving sexual therapy in all areas except sexual desire and pain.

Effect of Treatment

Chemotherapy, radiation, mastectomy, lumpectomy, or tamoxifen were not related to changes in sexual health as measured by FSFI scores. The impact of any single treatment is unknown because almost all patients had two or more types of treatment.

Psychosocial Variables

The relative importance of the personal and interpersonal variables studied in this study—age, depression, body image, and quality of their marital relationship (relationship distress)—on sexual functioning was analyzed using correlation and multiple regression. Table 4 presents the significant correlations between the explanatory variables and the dependent variable, sexual functioning.

Age

Preliminary analysis revealed that the sexual functioning scores of BCSs who were more than 70 years old (*n* = 3) were very low. When the data about these older women were used, age was the only variable significantly related to every measure of the dependent variable. When the oldest were removed, age was only related to the level

Table 5. Significant Predictors[a] of Measures of Sexual Functioning Using Multiple Regression (R^2) (n = 55)

Variable	Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total FSFI
Relationship distress		0.16**	0.18***	0.14**	0.30***	0.08*	0.16**
Role orientation	0.09*						
Depression	0.08*						
Testosterone							
Body image							
Age			0.09***			0.09*	
Total variance explained	0.17*	0.16**	0.27***	0.14**	0.30***	0.17**	0.16***

[a] R^2 for variables with significance.
*p = 0.05, **p = 0.01, ***p = 0.001.

of sexual pain. Consequently the sample was limited to BCSs between the ages of 41 and 69 years.

Depression

Table 4 shows that depression was significantly related to sexual desire (r = –0.31; p < 0.05), even though only 10% of the sample was clinically depressed. Others (19) too have found that women who are depressed are more likely to have lower sexual desire. Women who are not depressed are more likely to have higher desire. In this study the BCSs' level of depression was unrelated to their sexual arousal, lubrication, orgasm, or sexual pain.

Antidepressants themselves are known (20) to have undesirable effects on sexual functioning. BCSs in this study who were on antidepressants had significantly greater problems becoming aroused (F = 5.33; p < 0.03) and having orgasms (F = 5.89; p < 0.02) than survivors who were not on antidepressants.

Relationship

Patterns of communication and problem solving are significantly related to sexual functioning in BCSs. Survivors who reported more relationship distress (i.e., difficulty solving problems, lack of emotional support, and more general concern about their relationship with their partners) reported poorer arousal, lubrication, orgasm, and sexual satisfaction (Table 4). Relationship distress was not related to the amount of desire or sexual pain.

In this sample the BCSs' view of themselves was related to the level of sexual desire. Women who had a nontraditional, more equalitarian view of their roles tended to report higher desire levels than women who were more traditional. These women tended to have lower sexual desire scores. The BCSs' perception of their role was not related to any other sexual function measure.

Body Image

The BCSs' perception of their body was significantly related to depression (r = 0.65; p < 0.001). Women who were depressed tended to have a negative image of their bodies. Body image was related to only one aspect of sexual function, sexual satisfaction (Table 4). Women who had a poor body image tended to be more dissatisfied with their sexual relationship; women who had a better body image were more satisfied (r = –0.29; p < 0.05). Poor body image did not appear to affect any other aspect of sexual functioning. Contrary to the results in other studies (21), body image was not related to the number of years since diagnosis or the time since mastectomy or lumpectomy.

Physiological Variable: Testosterone

In this sample, the level of total serum or free testosterone was unrelated to the type or length of cancer treatment, age, or any FSFI sexual dysfunction measure. It is important to note that 29.8% (13/45) of the BCSs whose blood was analyzed for free testosterone and 15.4% (2/13) of BCSs whose blood was analyzed for total serum testosterone had abnormally low testosterone levels. The ranges were less than 0.02–0.17 pg/ml (mean 0.04; SD 0.04) and 12–65 ng/dl (mean 39.6; SD 17.9), respectively.

Multidimensional Analysis

To understand what factors are the best predictors of sexual functioning, the computed variables relationship distress, depression, age, and body image were entered into a linear stepwise multiple regression equation using each measure of the dependent variable. Relationship distress (Table 5) explained 16–30% of the variance in BCSs' arousal, orgasm, satisfaction, and overall sexual functioning scores. Relationship distress plus age explained significant variance in two measures of sexual functioning, pain (17%) and lubrication (27%). The degree of depression and role orientation explained 17% of the variance in

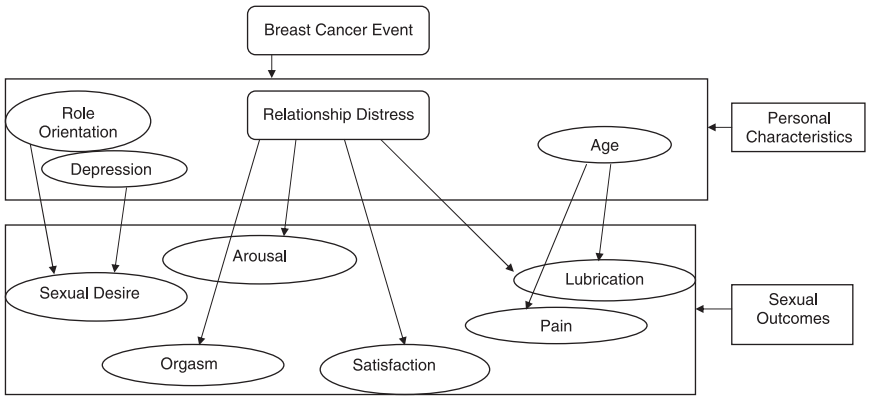

Figure 1. Conceptual Model of Relationship of Personal and Interpersonal Factors on Sexual Functioning in Breast Cancer Survivors (Multiple Regression) ($n = 55$).

sexual desire. Figure 1 illustrates these relationships. Body image and testosterone did not explain any significant portion of the variance in any of the dependent variable measures.

DISCUSSION

The BCSs in this study had more sexual dysfunction than the average female population, but were not as dysfunctional as women seeking therapy for sexual disorders. While historically, practitioners have expected that certain types of cancer treatments (22–25) will cause more sexual dysfunction, this study did not support this hypothesis.

Body image, although correlated with sexual satisfaction, did not explain a significant portion of any variance in the dependent measures of sexual functioning. This could have been due to the lack of variance in body image scores, since most of the BCSs had positive body images.

The analysis of sexual dysfunction in this study revealed that this construct probably has four dimensions: desire, physiological responses (arousal, lubrication, and orgasm), satisfaction, and pain. Each of the four dimensions reacted somewhat differently than the others. Desire appears to be the most independent, affected by the woman's role and depressed feelings. Arousal, lubrication, and orgasm patterns of responses were very much alike. Satisfaction is a more general phenomenon, which apparently does not necessarily include the ability to have orgasms. Pain and lubrication appear to be very interrelated.

Sexual desire appears to be a dimension of sexuality that reacts rather independently when women become ill. Desire may be a psychological phenomenon affected by the emotional impact of the illness threat, regardless of the quality of the relationship, body image, or medical treatment. Knowing that depression is highly related to loss of desire, physicians need to discuss the impact that depression can have on the woman herself and her relationship with her partner (26). Both patients and partners need to know that during the period of depression and subsequent loss of sexual desire they need to find alternative strategies for expressing care and love.

The quality of women's relationship health appears to be a stronger predictor of sexual function than the physical or chemical damage to the body after cancer treatment. The quality of the relationship appears to be an important factor in determining BCSs' sexual function in the physiological processes of arousal-lubrication-orgasm and satisfaction. Others (27) have found that the sexual satisfaction of BCSs who can confide in their husbands and who feel understood was greater than the sexual satisfaction of women who do not confide in their husbands. Positive communication, strong problem-solving skills, and women's positive feelings about their relationships appear to decrease the likelihood of sexual dysfunction. Being able to talk about feelings and concerns and feeling understood and loved, and being able to find satisfactory solutions for the problems that cancer brings are important.

Age is related to the amount of lubrication and sexual pain BCSs experience. The effects of decreased estrogen secondary to menopause are well documented, especially the thinning of the vaginal wall and diminished lubrication, factors associated with painful intercourse. Being menopausal before cancer treatment increases the chances of having less lubrication and more sexual pain after treatment. This difference was not explained by a difference in testosterone levels in pre- and postmenopausal women. However, in this study, lubrication concerns appear to be a consequence of age and the quality of the relationship.

Determining whether testosterone has a direct effect on sexual functioning has been difficult because commercial assay methods are not particularly sensitive or reliable at lower hormone levels. Hormone assays provide biological markers for extreme testosterone deficiencies, but there is

little information about how or if varying levels of testosterone characterize different types of sexual dysfunction. This study failed to identify any relationship between testosterone and sexual dysfunction. Future studies should include a more sensitive assay of a larger population in order to determine if there is an association between testosterone and sexual dysfunction.

Psychosocial sexual assessments should be included in the oncology physicians' standard assessment protocol and treatment plans (28–30). BCSs who have decreased desire or arousal, or who have expressed concerns about their relationship with their partner may profit from counseling or sexual health education early in the course of their disease. Learning to tell their partner what is sexually pleasurable and how to communicate and problem solve more effectively may provide them with better internal resources for the illness and treatment road ahead.

There are important limitations in this study. The sample was small and included women who had different cancer treatments over different lengths of time. Two methods of assaying testosterone levels were used, making comparisons impossible. The sample may be unique; BCSs who agreed to participate may be healthier and more interested in remaining sexually active than survivors who refused to participate.

There are measurement problems in sexual functioning research. According to the authors' instructions, women who did not have any sexual activity within the past month received a zero on more than half of the FSFI items. The instrument does not solicit information about why they did not have sex within the last month. A low score (zero) creates a spuriously low score if the women did not have sex because they did not have any sexual opportunities within that month. On the other hand, a zero score would appear to be appropriate for women who did not have any solitary or relationship sexual experiences because of the BCSs' physical or emotional condition. Many sexual assessment instruments, including the FSFI, erroneously assume that sexual functioning is the sum total of each sexual subscale. Even though subscales are highly interrelated, adding subscores is inappropriate because the instrument is not unidimensional. Using the FSFI total score clouds variations in sexual functioning and makes pattern analysis, differential diagnosis, and treatment difficult.

When sexual functioning instruments are used, it is important to determine how the subjects feel about their sexual health in order to know whether intervention is appropriate. Some subjects may not have a high sexual function score, but may be entirely satisfied. Current sexual function instruments do not include ways to control for this possibility. In the future, practitioners and researchers should add a "sexual distress scale" to sexual functioning assessment tools in order to determine whether subjects who have sexual dysfunction are distressed about it and would like to be sexually responsive (31). Despite these limitations, this study has used standardized instruments that allow comparisons of BCSs with normal populations. These analyses have demonstrated that breast cancer patients do have reduced sexual function, and that personal and interpersonal factors influence female sexual response.

The results of this study support the need for further research on desire, arousal-lubrication-orgasm, satisfaction, and pain in BCSs. For medical interventions to be effective, physicians must know the cause of sexual dysfunction in BCSs. These causes may be multifactorial, requiring multiple interventions. Without knowing the cause, interventions may be ineffective. The identification of factors that cause sexual dysfunction will help clinicians anticipate problems and guide therapy.

Building a predictive model of BCS sexual dysfunction will require longitudinal study of large samples within similar age ranges receiving similar treatment regimes. Since normal physiological changes during a woman's life cycle change sexual responsiveness, studies should focus on women who are either pre- or postmenopausal or within 10-year age spans.

Acknowledgments

This research was funded through the vonReis Breast Cancer Research Fund, William Beaumont Foundation.

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