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Pilot Study of Radical Hysterectomy Versus Radical Trachelectomy on Sexual Distress

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Radical trachelectomy, which leaves the uterus intact, has emerged as a desirable surgical option for eligible women with early-stage cervical cancer who wish to preserve fertility. The available data suggest excellent obstetrical outcomes with radical trachelectomy, and no differences in sexual responding between radical trachelectomy and radical hysterectomy. There is a need to examine the effect of radical hysterectomy on sexual distress given that it is distinct from sexual function. Participants were 34 women diagnosed with early-stage cervical cancer. The authors report 1-month postsurgery data for 29 women (radical hysterectomy group: n = *17,* M *age = 41.8 years; radical trachelectomy group:* n = *12,* M *age = 31.8 years), and 6-month follow-up data on 26 women. Whereas both groups experienced an increase in sex-related distress immediately after surgery, distress continued to increase 6 months after surgery for the radical hysterectomy group but decreased in the radical trachelectomy group. There were no between-group differences in mood, anxiety, or general measures of health. The decrease in sex-related distress in the radical trachelectomy but not in the radical hysterectomy group suggests that the preservation of fertility may have attenuated sex-related distress. Care providers should counsel women exploring surgical options for cervical cancer about potential sex distress-related sequelae.*

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Recent data estimate that 12,710 women were diagnosed with cervical cancer in the United States (American Cancer Society, 2011) and 1300 women were diagnosed in Canada in 2011 (Canadian Cancer Society's Steering Committee on Cancer Statistics, 2011). Many women diagnosed with cervical cancer are of childbearing age: It is estimated that 1 in 656 women will develop cervical cancer before 40 years of age (American Cancer Society, 2011), and early-stage disease is diagnosed most often in women younger than 50 years of age (American Cancer Society, 2010).

Over the past two decades, radical trachelectomy (RT) has become a desirable surgical option for eligible women with early-stage cervical cancer who wish to preserve fertility (Plante, Gregoire, Renaud, & Roy, 2011; Plante, Renaud, François, & Roy, 2004; Plante, Renaud, Hoskins, & Roy, 2005). In contrast with hysterectomy, fertility is preserved with the RT procedure because the uterus remains in place but the cervix, parametrium, and upper one third of the vagina are removed. Research has shown that a desire for future childbearing is the main reason women might elect RT (Carter, Sonoda, & Abu-Rustum, 2007), and excellent fertility and obstetrical outcomes associated with this procedure have been documented (Plante et al., 2011). In a recent report of 125 women who received RT, 58 conceived 106 pregnancies, with rates of pregnancy loss during the first and second trimesters comparable to those of the general population (Plante et al., 2011). In addition, 73% of the pregnancies reached the third trimester, and 75% of those pregnancies were delivered at term (Plante et al., 2011). The cancer recurrence-free survival rate associated with RT (96%) was also excellent (Plante et al., 2011), suggesting that there is no compromise in survival rates with this more conservative treatment (in comparison with radical hysterectomy) that retains fertility (Plante, 2008; Plante et al., 2004; Xu, Sun, & Wang, 2011).

With improvements in the identification and treatment of cervical cancer, there has been an increase in the number of young cancer survivors and a need to investigate quality of life issues and survivorship, including sexual and emotional health after treatment. One quality-of-life domain that has received considerable attention in this population is sexual health, and cervical cancer survivors consistently show higher rates of sexual difficulties in comparison with cancer-free age-matched controls. For example, approximately one quarter of women treated for cervical cancer (the majority receiving a radical hysterectomy; RH) experience negative sexual sequelae, including difficulties with lubrication, reduced vaginal length and elasticity, and marked distress (Bergmark, Avall-Lundqvist, Dickman, Henningsohn, & Steineck, 1999). Sexual problems including dyspareunia, decreased lubrication, reduced sensations around areas of the labia, reduced vaginal length, and dissatisfaction with one's sexual relationship have been documented up to 2 years after RH for treatment of cervical cancer (Pieterse et al., 2006). Furthermore, women who received RH have impaired blood flow when measured with a vaginal photoplethysmograph (a physiological measure of sexual

arousal) compared with cancer-free controls (Maas et al., 2004); similar results (although they did not quite reach statistical significance) have been found when comparing women who received RH without nerve-sparing to women who received nerve-sparing RH and controls (Pieterse et al., 2008).

Because of the presumption that the uterus is important for women's sexual response (Drellich & Bieber, 1958), and because fertility preservation may presumably improve sexual functioning indirectly through its effects on improved mood, relative to RH (Maas, Weijenborg, & ter Kuile, 2003), it is reasonable to assume that RT is associated with fewer negative sexual sequelae than RH. Recent research has examined the question of whether sexual response is altered with RT. Among 30 women scheduled to undergo RT for cervical cancer, 83% reported being fearful of having sex, with the degree of fear tending to decrease over time after surgery (Carter, Sonoda, Chi, Raviv, & Abu Rustum, 2008). Carter et al. (2008) also reported that more women attempted sexual intercourse and postoperative dyspareunia decreased with time. In addition, there is some speculation that emotional distress, while still present for many women after RT, also improves over time. For example, Carter, Sonoda, and Abu-Rustum (2007) found that whereas 100% of their patients reported mild to moderate levels of distress during a preoperative assessment, this dropped to 81% at 3 and 6 months after RT.

Because of increasing emphasis on informed patient decision making in medicine, an understanding of the benefits and potential disadvantages of these two surgical procedures as they relate to sexual outcomes is important for women to be adequately informed about the risks and benefits of different surgical modalities. A 2-year prospective study compared women with early-stage cervical cancer who consented to RT versus RH on measures of cancer-related distress, mood, quality of life, and sexual function (Carter et al., 2010). No significant differences were found between groups on these measures, and both groups reported improvements in distress, mood, quality of life, and sexual function over time after surgery. Overall sexual function levels, as measured by the Female Sexual Function Index (Rosen et al., 2000), fell in the range of women with a diagnosed sexual dysfunction for both groups at baseline and improved 2 years after surgery but remained in the range of women with sexual dysfunction (Carter et al., 2010).

To date, there has been no empirical study of sex-related distress after RT. Because sexual distress represents one of the most significant long-term sequelae of surgery for early-stage cervical cancer (Bergmark, Avall-Lundqvist, Dickman, Henningsohn, & Steineck, 2002), and because sexual distress may persist despite no impairments in sexual desire, arousal, or orgasm (Hays, 2008), the primary goal of our pilot study was to prospectively measure differences in sex-related distress in women receiving RT versus RH. Carter et al. (2010) found significant (nonsexual) distress in both groups at baseline that improved over time after RT or RH. Because RT is selected for women desiring fertility preservation, it is possible that this procedure

may be associated with more positive feelings regarding sexuality. Thus, we hypothesized significantly less sex-related distress and fewer impairments in secondary endpoints of mood, anxiety, and quality of life with RT compared with RH.

METHOD

Participants

Participants were 34 women diagnosed with early-stage cervical cancer (Stages 1A–1B) who completed baseline questionnaires before surgical treatment by RH or RT. Of these women, 29 also completed questionnaires 1 month after surgery. Of the 29 women, 17 received RH (M age = 41.8 years, SD = 9.7 years) and 12 received RT (M age = 31.8 years, SD = 4.2 years). A small proportion of women in both groups had received some adjuvant chemotherapy or radiation treatment: 2 of RH and 1 of RT women received chemotherapy, and 2 of RH and none of the RT women received radiation therapy. Demographic characteristics of these women are presented in Table 1. The majority were Caucasian (89.7%) and had received at least some postsecondary education (69%). Also, most women were in a relationship (86.2%); among these 25 women, 92% reported being satisfied with the level of closeness in their current relationship. All but 1 woman reported engaging in sexual activity, either alone or with a partner at least once over the past month before their surgery (92.9%). Sexual activity was defined either as sexual caressing, foreplay, masturbation, or vaginal intercourse. Only 1 woman who received a RH reported ever having received treatment for a sexual difficulty. In addition, 26 women (15 with RH, 11 with RT) from the original sample completed questionnaires 6 months after surgery (89.7% retention).

Procedure

Women who were scheduled to receive RH or RT at the British Columbia Cancer Agency were recruited for this study if they had a diagnosis of Stage I cervical cancer. We used two methods of recruitment: the first method had cancer center oncologists identify eligible women from their database of current surgical patients. A research assistant who was present at the cancer center then explained the study procedures and provided prospective participants with a package containing a study information sheet, consent form, validated questionnaires, and a self-addressed, postage-paid envelope. The second method involved a research assistant mailing a study information letter and questionnaires to all women who were scheduled to receive either RH or RT for early-stage cervical cancer at our center. All women were directed to read the consent form at their leisure before making a decision about participating in the study; those who were interested in participating

TABLE 1. Demographic Information on Radical Hysterectomy ($n = 17$) and Radical Trachelectomy ($n = 12$) Participants

Variable	Radical hysterectomy	Radical trachelectomy
Age in years, *M* (*SD*)*	41.8 (9.7)	31.8 (4.2)
Number of children (*SD*)	1.4 (1.3)	0.7 (0.8)
Length of current relationship in years, *M* (*SD*)	7.1 (6.6)	4.3 (4.0)
Length of longest relationship in years, *M* (*SD*)*	11.5 (6.5)	6.0 (3.0)
Ethnicity		
Caucasian	16	11
Asian	0	1
Other	1	0
Highest level of education		
High school	6	3
Undergraduate degree	4	3
Graduate degree	3	2
Some postsecondary education	1	3
College diploma	3	1
Relationship status		
Married/common law	0	1
Single/dating	11	7
Separated	5	4
Engaged	1	0
Currently satisfied with the level of closeness in your relationship		
Yes	13	11
No	1	1
Not currently in a relationship	3	0
Received chemotherapy		
Yes	2	1
No	15	11
Received radiation treatment		
Yes	2	0
No	15	12

*The mean difference between the radical hysterectomy and radical trachelectomy groups are significant, $p < .05$.

subsequently completed the consent form and questionnaires and returned them in the mail before their scheduled surgery. The same battery of questionnaires were mailed to participants 1 and 6 months after surgery. The research ethics board of our cancer agency and the University of British Columbia approved all procedures.

Measures

Female Sexual Distress Scale

The Female Sexual Distress Scale (Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002) is a 12-item self-report questionnaire assessing for sexuality-related personal distress, and was the primary endpoint in this study. Scores on this scale range from 0 to 48, with higher scores representing higher levels

of distress. The scale has been shown to have good discriminant validity for differentiating between sexually dysfunctional and sexually functional women, with 88% or higher correct classification rate (Derogatis et al., 2002). It also has good internal consistency, high test–retest reliability over 4 weeks, and moderate construct validity.

Beck Depression Inventory

The Beck Depression Inventory (Beck & Beamesderfer, 1975) is a 21-item self-report questionnaire that is designed to assess the severity of depressive symptoms. Items on the Beck Depression Inventory are designed specifically to be consistent with diagnostic criteria for major depressive disorder, as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; American Psychiatric Association, 2000). Each item is rated on a 4-point scale ranging from 0 to 3, with higher numbers reflecting increasing severity; total scores on the Beck Depression Inventory range from 0 (*not depressed*) to 63 (*severely depressed*). A score $\geq$14 denotes mild clinical depression.

Beck Anxiety Inventory

The Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988) is a 21 item self-report questionnaire designed to measure the severity of anxiety symptoms. The inventory was found to have high internal consistency and test-retest reliability over one week (Beck et al., 1988). Each item is rated along a 4-point scale from 0 (*not at all*) to 3 (*severely, I could barely stand it*). Total scores on the Beck Anxiety Inventory can range from 0 to 63, with higher numbers reflecting increasing severity of anxiety symptoms. Beck and Steer (1993) recommended that scores of 0–7 points be interpreted as minimal anxiety, 8–15 as mild anxiety, 16–25 as moderate anxiety, and 26–63 as severe anxiety.

The RAND 36-item Short Form Health Survey 1.0

The RAND 36-item Short Form Health Survey 1.0 (Hays, Sherbourne, & Mazel, 1993) is a self-report questionnaire that assesses health-related quality of life. This measure contains the following eight subscales: physical functioning, role limitations caused by physical health, bodily pain, general health, energy/fatigue, social functioning, role limitations caused by emotional problems, and emotional well-being. Although the scoring varies for the pain and general health scales on this measure, the RAND 36-Item Health Survey 1.0 includes the same items as the MOS 36-Item Short-Form Health Survey (SF-36; Hays et al., 1993; Ware & Sherbourne, 1992). Correlations

of .99 have been found for the pain and general health scales as scored by the RAND 36-Item Health Survey 1.0 and SF-36 (Hays et al., 1993). Higher scores on the RAND 36-Item Health Survey 1.0 indicate better health. The SF-36 has demonstrated evidence of validity, including concurrent, construct, content, criterion, and predictive validity, and acceptable rates of reliability (for a review, see Ware, 2000).

RESULTS

Demographic and Cancer-Related Information

Significant group differences were found for age, $t(27) = 3.35$, $p < .01$; and length of longest relationship $t(24) = 3.04$, $p < .01$, between women who had a RH and those who had a RT. As expected, women who received a RH were older and had been in a longer relationship in comparison with women who received a RT. No other demographic differences were found between the two groups (Table 1).

Effects of Surgery on Sex-Related Distress

From baseline to 1 month after surgery, the main effects of surgery type and time, as well as the Surgery Type × Time interaction, were not statistically significant for sex-related distress, ps > .05. However, there was a significant Surgery Type × Time interaction for sex-related distress from 1 month to 6 months after surgery, $F(1, 24) = 4.28$, $p < .05$. As shown in Table 2, the mean Female Sexual Distress Scale score for the RT group fell by nearly 7 points and increased for the RH group during this interval. To explore the interaction further, we subsequently conducted a repeated measures analysis of variance (with Female Sexual Distress Scale scores as the dependent variable) on all women who completed questionnaires at every time point. This analysis revealed an overall significant Surgery Type × Time interaction on the Female Sexual Distress Scale, $F(2, 48) = 3.30$, $p < .05$ (see Table 3). As shown in Figure 1, sex-related distress increased for both groups from baseline to 1 month after surgery; however, whereas sex-related distress continued to increase over time for the RH group, scores decreased for the RT group from 1 to 6 months after surgery.

The overall proportion of women who were sexually active, defined as sexual caressing, foreplay, vaginal intercourse, or masturbation, significantly fell, from 92.9% at baseline to 71.4% at 1 month after surgery ($p = .04$).

Effects of Surgery on Mood and Anxiety

From baseline to 1 month after surgery, the main effects of surgery type and the Surgery Type × Time interactions were not statistically significant for mood or anxiety. Also, the main effect of time from baseline to 1 month

TABLE 2. Effects of Surgery on Sex-Related Distress, Mood, Anxiety, and Quality of Life Before Surgery and 1 and 6 Months After Radical Hysterectomy and Radical Trachelectomy

Measure	Type of analysis	Time from surgery	Radical hysterectomy			Radical trachelectomy			
			n	*M*	*SD*	*n*	*M*	*SD*	*p*
Female Sexual Distress Scale	Primary	Baseline	17	9.78	9.76	12	10.00	11.09	—
		1 month after	17	10.59	11.60	12	13.33	11.27	*ns*
	Secondary	1 month after	15	11.20	12.21	11	11.73	10.28	—
		6 months after*	15	13.20	11.58	11	4.82	6.00	.049*
Beck Depression Inventory	Primary	Baseline	17	10.53	5.17	12	8.50	5.14	—
		1 month after	17	8.00	7.13	12	8.17	4.37	*ns*
	Secondary	1 month after	15	8.80	7.22	11	7.91	4.48	—
		6 months after‡	15	7.33	5.69	11	3.45	3.17	.004‡
Beck Anxiety Inventory	Primary	Baseline	17	10.12	6.51	12	11.17	6.81	—
		1 month after†	17	7.29	7.87	12	7.75	4.69	.005†
	Secondary	1 month after	15	8.00	8.13	11	7.09	4.30	—
		6 months after‡	15	7.33	7.19	11	2.55	2.42	.032‡
SF-36; Physical functioning	Primary	Baseline	16	86.88	18.52	12	93.33	14.03	—
		1 month after†	16	73.75	21.49	12	76.67	24.15	.009†
	Secondary	1 month after	15	72.00	21.03	11	77.27	25.24	—
		6 months after‡‡	15	94.67	7.43	11	98.18	4.62	<.001‡‡
SF-36; Role limitations caused by physical health	Primary	Baseline	17	60.29	46.82	12	77.08	36.08	—
		1 month after††	17	22.06	41.35	12	31.25	42.81	<.001††
	Secondary	1 month after	15	11.67	31.15	11	34.09	43.69	—
		6 months after‡‡	15	75.00	35.36	11	88.64	25.89	<.001‡‡
SF-36; Role limitations caused by emotional problems	Primary	Baseline	17	50.98	44.28	12	50.00	38.92	—
		1 month after	17	66.67	40.82	12	58.33	40.51	*ns*
	Secondary	1 month after	15	62.22	41.53	11	63.64	37.87	—
		6 months after	15	75.56	34.43	11	90.91	21.56	.018‡‡

(Continued on next page)

TABLE 2. Effects of Surgery on Sex-Related Distress, Mood, Anxiety, and Quality of Life Before Surgery and 1 and 6 Months After Radical Hysterectomy and Radical Trachelectomy *(Continued)*

Measure	Type of analysis	Time from surgery	Radical hysterectomy			Radical trachelectomy			p
			n	M	SD	n	M	SD	
SF-36; Energy/fatigue	Primary	Baseline	17	57.35	19.45	12	63.75	22.27	—
		1 month after	17	52.65	22.51	12	51.67	21.03	.054[a]
	Secondary	1 month after	15	49.67	22.32	11	50.91	21.89	—
		6 months after‡‡	15	63.67	26.76	11	70.91	11.79	<.001‡‡
SF-36; Emotional well-being	Primary	Baseline	17	65.41	15.10	12	67.33	19.43	—
		1 month after†	17	71.76	21.70	12	74.00	12.59	.027†
	Secondary	1 month after	15	69.07	21.72	11	75.27	12.37	—
		6 months after‡	15	76.27	13.89	11	84.00	7.16	.005‡‡
SF-36; Social functioning	Primary	Baseline	17	69.12	19.82	12	66.67	24.03	—
		1 month after	17	61.76	28.11	12	67.71	15.50	*ns*
	Secondary	1 month after	15	56.67	25.82	11	68.18	16.17	—
		6 months after‡‡	15	82.50	23.53	11	95.45	11.56	< .001‡‡
SF-36; Pain	Primary	Baseline	17	79.71	22.55	12	80.21	24.11	—
		1 month after†	17	56.91	23.09	12	60.63	25.48	.002†
	Secondary	1 month after	15	52.50	20.79	11	63.18	25.05	—
		6 months after‡‡§	15	73.50	22.44	11	93.41	9.89	< 0.001‡‡; 0.037§
SF-36; General health	Primary	Baseline	16	67.50	22.88	11	75.91	14.29	—
		1 month after	16	70.63	24.49	11	80.00	10.25	*ns*
	Secondary	1 month after	15	69.33	24.78	11	80.00	10.25	—
		6 months after	15	73.00	19.80	11	81.36	17.76	*ns*

Note. Repeated measures analysis of variance was used for primary and secondary analysis: For primary, time (baseline, 1 month after) and surgery type (radical hysterectomy, radical trachelectomy) were the main effects; for secondary, time (1 and 6 months after surgery) and surgery type (radical hysterectomy, radical trachelectomy) were the main effects. Higher Female Sexual Distress Scale scores indicate more sex-related distress. Higher RAND 36-Item Health Survey (SF-36) scores indicate a better state of health. Higher Beck Depression Inventory scores indicate increased severity of depressive symptoms. Higher Beck Anxiety Inventory scores indicate increased severity of anxiety.

*Significant Surgery Type × Time interaction between 1 and 6 months after surgery, $p < .05$.

†Significant main effect of time between baseline and 1 month after surgery, $p < .05$.

††Significant main effect of time between baseline and 1 month after surgery, $p < .001$.

‡Significant main effect of time between 1 and 6 months after surgery, $p < .05$.

‡‡Significant main effect of time between 1 and 6 months after surgery, $p < .001$.

§Significant main effect of surgery type between 1 and 6 months after surgery, $p < .05$.

[a]Marginal effect of time between baseline and 1 month after surgery.

TABLE 3. Effects of Surgery Type on Sex-Related Distress, at 1 and 6 Months After Surgery, for a Subset of Participants Who Completed Questionnaires at Every Time Point

		Baseline		1 month after surgery		6 months after surgery	
Surgery type	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Radical hysterectomy	15	9.02	9.01	11.20	12.21	13.20	11.58
Radical trachelectomy	11	9.09	11.15	11.73	10.28	4.82	6.00

Note. Higher Female Sexual Distress Scale scores indicate more sex-related distress. There was a statistically significant Surgery Type × Time interaction on Female Sexual Distress Scale scores, $p < .05$.

after surgery was not significant for mood. During this period, however, there was a significant main effect of time on participants' level of anxiety, $F(1, 27) = 9.12$, $p < .01$. In particular, levels of anxiety decreased from baseline to 1 month after surgery for women in the RT and RH groups.

From 1 to 6 months after surgery, the main effect of time was statistically significant for both mood, $F(1, 24) = 10.14$, $p < .01$, and anxiety, $F(1, 24) = 5.17$, $p < .05$. For both groups, there was a significant decrease in mood and anxiety symptoms from 1 to 6 months follow-up. The main effect of surgery

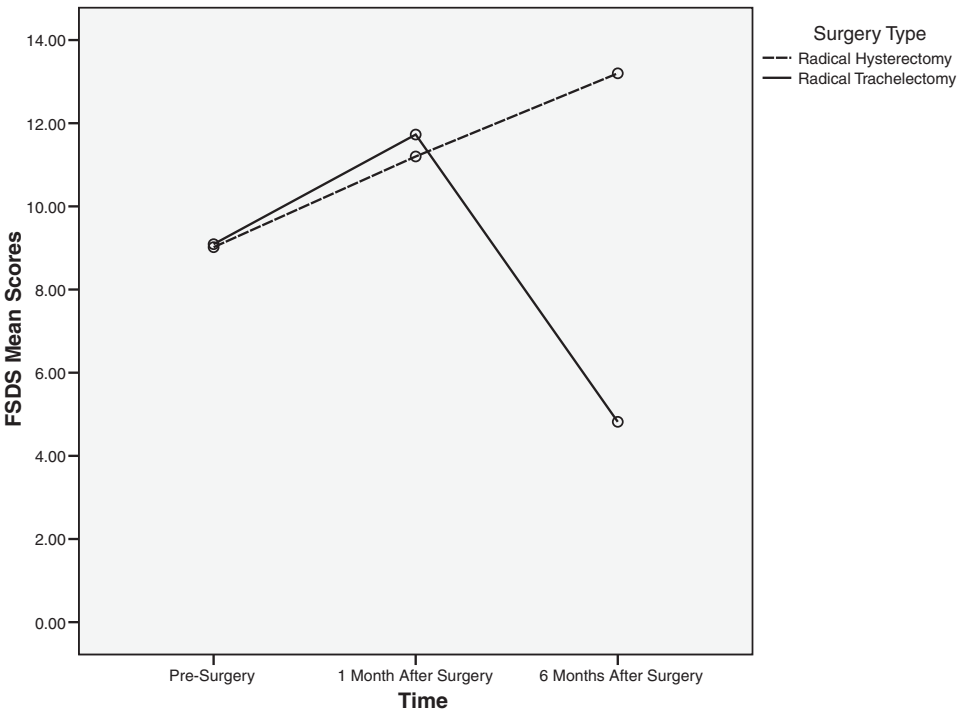

FIGURE 1. Surgery Type × Time interaction for sex-related distress, measured by the Female Sexual Distress Scale (FSDS).

type and the Surgery Type × Time interaction were not significant from 1 to 6 months after surgery for either mood or anxiety.

Effects of Surgery on Quality of Life

The main effect of surgery type was not significant for any of the SF-36 subscales from baseline to 1 month after surgery. There was, however, a statistically significant main effect of time from baseline to 1 month after surgery for physical functioning, $F(1, 26) = 8.03$, $p < .01$; role limitations caused by physical health, $F(1, 27) = 16.79$, $p < .001$; pain, $F(1, 27) = 11.20$, $p < .01$; and emotional well-being, $F(1, 27) = 5.46$, $p < .05$. In addition, there was a marginally significant main effect of time on levels of fatigue, $F(1, 27) = 4.07$, $p = .054$. For women in both groups, physical functioning decreased, and role limitations, pain, and levels of fatigue increased during this interval. Despite these changes, women's level of emotional well-being was higher at 1 month after surgery compared with baseline. No Surgery Type × Time interactions were significant for any of the SF-36 subscales from baseline to 1 month after surgery.

As indicated by the significant main effects of time for all of the SF-36 subscales (except general health), several improvements in women's emotional and physical functioning emerged 6 months after surgery. In particular, from 1 to 6 months after surgery, there was a significant increase in women's physical functioning, $F(1, 24) = 27.07$, $p < .001$; level of energy, $F(1, 24) = 18.81$, $p < .001$; emotional well-being, $F(1, 24) = 9.51$, $p < .01$; and social functioning, $F(1, 24) = 31.76$, $p < .001$. There was also a significant decrease in women's pain, $F(1, 24) = 35.17$, $p < .001$, and significant improvement in role limitations caused by physical health, $F(1, 24) = 44.93$, $p < .001$, and emotional problems, $F(1, 24) = 6.41$, $p < .05$. Pain was the only SF-36 subscale for which there was a significant main effect of surgery type, $F(1, 24) = 4.86$, $p < .05$, with women in the RH group reporting significantly higher levels of pain from 1 to 6 months after surgery. No Surgery Type × Time interactions were found from 1 to 6 months after surgery for any of the SF-36 subscales.

DISCUSSION

This study represents the first empirical investigation of sex-related distress after RT. Importantly, a significant interaction between surgery type (RH vs. RT) and time was found with regard to sex-related distress. The findings indicate that sex-related distress increased for all women immediately after surgery, and continued to increase from 1 to 6 months after surgery for women who underwent RH; during this time, however, such distress significantly lessened for women who received RT. From 1 to 6 months after

surgery, women in both groups also reported a significant reduction in symptoms of depressed mood. Time had an effect on women's levels of anxiety as well, with women in both groups reporting fewer symptoms of anxiety from baseline to 1 month after surgery and from 1 to 6 months after surgery. It may not be surprising that RH and RT were associated with postsurgical changes in women's quality of life at 1 month after surgery compared with baseline. In particular, women in both groups reported reduced physical functioning and increases in pain, levels of fatigue, and role limitations caused by physical health 1 month after surgery. In this same time period, however, women in both groups also reported higher levels of emotional well-being. Women's quality of life after surgery improved with time on a number of domains: Six months after surgery, women in both groups reported increases in physical functioning, emotional well-being, energy, and social functioning, and fewer role limitations and pain, when compared with the same 1 month after surgery. Of note, RT was associated with less bodily pain in this study, such that women who received RH reported more pain 6 months after surgery compared with women in the RT group.

Whereas general distress did not significantly differ between the RT and RH groups in a previous prospective trial (Carter et al., 2010), here we have shown specifically that sex-related distress remained elevated in the RH but not the RT group when women were reassessed 6 months after surgery. It is possible that this time corresponds to the period when women were resuming sexual activity; however, given that fewer women were sexually active after surgery (71.4%) compared with at baseline (92.9%), this suggests that the decrease in sexual distress was not a function of increased frequency of sexual activity, per se. Moreover, although we did not measure sexual response in this study, others have found that rates of sexual dysfunction also do not differ in the long-term between women receiving RT and those receiving RH (Carter et al., 2010); thus, this effect on distress is not attributable to group differences in sexual response. The FSDS taps the emotional aspect of one's sex life, without focusing on a specific sexual function or response. Thus, it is possible for a woman to have no overt difficulties with sexual arousal or orgasm, yet still experience guilt, regret, or embarrassment about her sex life (Hays, 2008). We might interpret this here as indicating that there are significant emotional sequelae to RH in young women that are abated when the surgical treatment involves preservation of the uterus. It is possible that because reproductive ability is preserved in the RT group, engaging in sexual activity might be more likely to be associated with positive, rather than negative, emotions, in particular if a woman and her partner are desiring conception. For a woman who has lost fertility, sexual activity may now evoke pointed negative emotions as it activates beliefs and reminders of her infertility. Because pain also was higher in the RH group, it is possible that sex-related pain elicited distress during periods of sexual activity, but not in the RT group.

Both groups of women experienced a reduction in symptoms of anxiety and depressed mood 1 month after surgery, with no significant between-group interactions. This also corresponds with the findings of Carter et al. (2010) in their recent prospective trial. Although it has been speculated that women choosing RH for cervical cancer may have higher baseline anxiety levels, particularly fears about cancer, here we did not see significant group differences in baseline anxiety. However, our experience is that, with time, women receiving RT may acquire new fears about cancer recurrence given that their uterus was left intact.

For women in both groups, physical functioning decreased, and role limitations, pain, and levels of fatigue increased immediately after surgery. Whereas physical symptoms such as pain, fatigue, and bowel dysfunction can be expected after invasive surgery for benign and malignant gynecological conditions (e.g., Carlson, Miller, & Fowler, 1994; Liu, Ercolano, Siefert, & McCorkle, 2010), physical and emotional quality of life tend to increase over time (Ferrandina et al., 2012; Lutgendorf et al., 2002) and, in some studies, reach similar levels to those reported by women without a history of cancer (e.g., Bradley, Rose, Lutgendorf, Costanzo, & Anderson, 2006). Among women who received surgical treatment for cervical, ovarian, or endometrial cancer, their levels of psychological well-being and functioning in daily living returned to similar or improved levels at 1-year follow-up compared with baseline (Greimel & Freidl, 2000).

There are important limitations of this study that must be borne in mind when considering the findings. First, the sample size is very small and this particular group of women may not be representative of the larger group of women with early-stage cervical cancer. We did not take a random sample of women; rather, we took consecutive cases of women during a fixed time period. Second, there are differences between the groups attributable to reasons why women may have sought RT. Because RT is a fertility preserving surgical method, these women were interested in having children whereas this may have been less likely a concern for women in the RH group. Thus, the RT group was younger, and less likely to have children at home—both of which may have factored into their sexual distress. Last, we did not gather systematic information on sexual response to determine which aspect of sexual response may have improved more in the RT group compared with the RH group. Instead we chose to focus on sexual distress given that this is often a more comprehensive measure and often represents the reason why women may seek treatment for a sexual concern.

The focus of this small study was on sex-related distress and there are implications for the care provider. In particular, the emotional experiences of women choosing RT may differ from those electing RH, and this may have a bearing on their sexual health. Sexual distress is an emotional construct that may provide a general barometer for how the woman perceives her sexual

life. Because women with RH experienced higher levels of sex-related distress, we concluded that the loss of fertility in women receiving RH may have, in part, been responsible for the increase in their sexual distress. Care providers who counsel early-stage cancer survivors about surgical treatment options should seek to address sexual health concerns in all women, and share with them the potential for negative sex-related emotional outcomes after surgery. However, in light of evidence for effective treatments to address the negative sexual sequelae of cancer (Brotto, Yule, & Breckon, 2010), women electing RH should also be equipped with adequate education and strategies for ameliorating such difficulties. Taken together with previous prospective research on sexual health and RT, these findings suggest that RT is associated with positive improvements in emotional and sexual functioning, and, compared with women receiving RH, significantly lower rates of sex-related distress.

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