

Perioperative sexual interest in women with suspected gynecologic malignancies

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HIGHLIGHTS

- Sexual health is an important part of gynecologic cancer patients' quality of life.
- Sexual interest and desire is significantly impacted by gynecologic cancer surgery.
- Perioperative counseling should address the changes in sexual health after surgery.

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ABSTRACT

Objectives. For women with gynecologic cancer, the impact of surgery on sexual interest and desire in the immediate and later postoperative period is not well characterized. The objective of this study was to report the perioperative trends of changing sexual interest and desire in a cohort of women undergoing surgery for suspected gynecologic malignancies.

Methods. This is an ancillary analysis of a cohort study analyzing health-related outcomes in women who underwent primary surgical management of a suspected gynecologic malignancy between 10/2013 and 10/2014. Subjects completed the Patient-Reported Outcomes Measurement Information System Sexual Function and Satisfaction Questionnaire (PROMIS-SFQ) preoperatively and questions on sexual interest and desire at one, three, and six months postoperatively. Bivariate tests and multiple linear regression were used to analyze data.

Results. Of 231 women who completed a baseline PROMIS-SFQ, 187 (81%) completed one-month, 170 (74%) three-month, and 174 (75%) six-month follow-up interviews. Following surgery, 71% of enrolled subjects were diagnosed with a malignancy. Women age <55 had a greater decrease in sexual interest from baseline to one month than women age >55 (-5.5 ± 1.0 vs -2.3 ± 0.9 , $p = 0.02$). In a multivariable analysis, age <55 remained associated with a larger decrease in sexual interest at one month postoperatively (-4.6 , 95% CI: $-1.8, -7.4$), as did having cancer vs benign disease for women of all ages (-5.6 , 95% CI: $-9.6, -1.5$).

Conclusions. This study provides new data regarding the timing and magnitude of changes in sexual interest following gynecologic oncology procedures.

1. Introduction

Women with gynecologic cancer have identified sexual health as an important dimension of quality of life [1]. Gynecologic oncology treatments have been known to affect sexual health, and gynecologic cancer

survivors often report some form of sexual dysfunction [2]. Prior studies have identified four domains of sexual health that are adversely affected by gynecologic cancer treatments: 1) body image, 2) gender role functioning, 3) sexual functioning, and 4) fertility [3]. As such problems persist well into the survivorship phase, sexual health issues greatly influence patients' ability to adjust and cope with the sequelae of gynecologic cancer [4]. Appropriately, the primary focus of cancer treatment centers on eradicating disease; however, even post-operatively, sexual health and the effect of treatment on sexual function are rarely

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addressed in routine oncologic counseling due to a number of patient and provider perceived barriers [5].

As women with gynecologic cancer have pathology that directly affects sexual organs, it is not surprising that a large proportion of women with gynecologic cancer report some form of sexual problem [2]. Furthermore, psychological distress from a cancer diagnosis and the physical pain and discomfort associated with undergoing surgery and adjuvant treatment can also negatively affect sexual health [6]. While surgical removal of gynecologic organs, such as the uterus, cervix, fallopian tubes and ovaries, can directly impact physical sexual function, the impact of surgery on sexual interest and desire in the immediate and later postoperative period for this patient population is not well characterized. Understanding these potential changes to sexual interest and desire after surgery can help physicians to better prepare women for postoperative survivorship [7]. Thus, the objective of this study was to investigate the patient-reported changes in sexual interest and desire in a cohort of women undergoing surgery for suspected gynecologic cancer, from baseline to six months after surgery.

2. Methods

This is an Institutional Review Board (IRB) approved ancillary analysis of a prospective longitudinal hospital-based cohort study of women enrolled in The Health Registry/Cancer Survivorship Cohort (HR/CSC) at the University of North Carolina (UNC). The primary study evaluated the impact of surgical complications on health-related quality of life in women undergoing gynecologic and gynecologic oncology procedures. In this primary study, all patients provided informed consent, and details on the study methods and recruitment have been previously published [8,9]. Briefly, for the HR/CSC, patients are identified and recruited through the UNC Health Care oncology outpatient clinics with the following eligibility criteria: age 18 years or older; North Carolina mailing address; and speak English or Spanish. Patients who are unable to provide informed consent or participate in interview questionnaires are excluded. For the primary study, eligibility was further restricted to HR/CSC patients who were recruited through the gynecologic oncology clinics with newly diagnosed suspected gynecologic cancer and planned surgical management. Exclusion criteria included primary surgery completed or to be completed at an outside institution, active chemotherapy or radiation treatment, and pregnancy. Among women with suspected cancer, those with final benign disease (29%) were retained in this analysis given that they underwent similar surgical procedures as those who ultimately received a cancer diagnosis. Stratified analysis comparing benign to cancer diagnosis was incorporated.

After enrollment, which occurred at the new patient visit, baseline interviews were conducted within two weeks, prior to surgery, by trained staff using a computer-assisted telephone interview software tool specifically developed for the HR/CSC. Follow-up interviews were conducted at one, three, and six-months after surgery. Patients were included who completed follow-up interviews within a three-week interval around each targeted time point (one week prior or up to two weeks after the target date [e.g. one, three or six months post-surgery]). Participants received gift cards as compensation after completion of each interview.

The structured Patient-Reported Outcomes Measurement Information System Sexual Function and Satisfaction Questionnaire (PROMIS-SFQ) was given to all participants at the baseline, preoperative interview [10]. The PROMIS-SFQ is validated to assess symptoms related to sexual function. The questionnaire has 10-items, which evaluates female sexual function and impact on quality of life. Within the questionnaire there are four subdomains: 1) global satisfaction with sex life, 2) interest in sexual activity, 3) lubrication, and 4) vaginal discomfort. Symptom severity is graded on a 10-point Likert-type scale over the past 30 days. PROMIS is scored using T-scores, which are standardized to the U.S. general population and have a mean of 50 and a standard

deviation of 10. Scores above or below 50 are above or below the population average in the U.S., respectively. A clinically meaningful difference, or minimally important difference (MID), for change in T-score for this scale is defined as one-half standard deviation (5 points) above or below population norms. The follow-up sexual data consisted of two questions on sexual interest and desire from the PROMIS-SFQ that each participant was asked at the one, three, and six month follow up: 1) "In the past 30 days, how interested have you been in sexual activity?" and 2) "In the past 30 days, how often have you felt like you wanted to have sex?" Responses from the baseline questionnaire and the limited, two-question survey on sexual interest and desire given at the follow up interviews were used for this analysis.

Patient age, self-reported race/ethnicity, marital status, and employment status were obtained from the HR/CSC baseline interview. Clinical data were abstracted from the electronic medical record at the time of new patient visit (BMI, co-morbid conditions, and cancer site) and during the 30-day post-operative follow up window (surgical procedure, postoperative complications, and adjuvant treatment plan). Insurance status at the time of new patient visit was also abstracted from the medical record. The medical record information was then merged with the HR/CSC demographic and interview data.

Univariate summary statistics were generated using simple frequencies and means with standard deviation where appropriate. Sexual interest scores were analyzed overall, and then stratified by selected clinical groups: final pathology, surgical route, menopausal status (age >55) and occurrence of postoperative complications. Student *t*-test was used to compare mean score changes between these groups. Multivariable modeling adjusting for cancer diagnosis, route of surgery, marital status and cancer site was performed with linear regression to compare the change in sexual interest by age. A *p* value <0.05 was considered statistically significant. Analysis was completed using Stata/IC version 13.0 (College Station, TX).

3. Results

Of 281 women who initially consented for the parent study, 231 (82%) completed baseline interviews. Of the 50 non-participants, 12 were ineligible due to protocol or withdrawal, and 38 did not reply to interview requests. Of the 231 women who completed the baseline interview, 187 completed one-month interviews, 185 of whom had complete medical record abstraction. These 185 comprised the final study cohort based on the a priori primary outcome measure, which represents 65% (185/281) of the initial enrollment cohort and 80% of those who completed baseline interviews. Subsequent follow up rates, based on the baseline interview, were 74% (170/231) at 3-months and 75% (174/231) at 6-months for the secondary outcome measures (Supplemental Fig. 1).

The demographics and baseline characteristics, including sexual function, of the study cohort are presented in Table 1. For the overall cohort, age at diagnosis ranged from 22 to 93 years, with a median of 58 and interquartile range of 46–81. The majority of subjects identified as White or Black; those who identified themselves as Asian (*n* = 2, 1%), Native American (*n* = 3, 1.6%), and Other (*n* = 5, 2.7%) were collapsed into an "Other" category for reporting. Of the eight subjects who identified as "Hispanic," one subject considered herself White, one as Black, and five as Other. The majority of patients underwent minimally invasive surgery, which included traditional or robotic-assisted laparoscopic surgery, and 13 (7%) of those patients underwent radical hysterectomy. The majority of patients had uterine cancer (45%), followed by ovarian, cervical, vulvovaginal and other, which included gastrointestinal and unspecified gynecologic cancer. For those undergoing laparotomy, 20 (10%) underwent debulking surgery and 12 (7%) underwent bowel surgery. BMI ranged from 17 to 58, with a median of 31.

Baseline sexual health information is also presented in Table 1. Compared with population averages (where 50 is general population mean score), at baseline, mean scores for global satisfaction with sex life in

Table 1
Demographics and baseline characteristics of study cohort.

Characteristics	Overall N = 185
Age (mean ± SD)	56.5 ± 13
Race (N, %)	
White	143 (77)
Black	32 (17)
Other	10 (5)
Cancer site (N, %)	
Uterine	84 (45)
Ovary	23 (12)
Cervix	17 (9)
Vulva/Vaginal	3 (2)
Other ^a	4 (2)
Benign	54 (29)
Baseline PROMIS-SFQ scores (Mean ± SD) ^b	
Vaginal discomfort	43.7 ± 8.4
Interest in sexual activity	44.8 ± 10.2
Lubrication	50.2 ± 7.7
Global satisfaction with sex life	56.3 ± 8.6
Insurance (N, %)	
None	14 (8)
Medicare only	8 (4)
Medicaid	7 (4)
Any private	156 (84)
Marital status (N, %)	
Partnered	114 (62)
Single	51 (28)
Widowed	20 (11)
Major comorbidity ^c (N, %)	
No	163 (88)
Yes	22 (12)
BMI (mean ± SD)	32.9 ± 9
Procedure type (N, %)	
Minimally invasive ^d	116 (63)
Laparotomy	60 (32)
Adjuvant therapy ^d (N, %)	
Yes	76 (41)
No	55 (30)
NA ^e	54 (29)

^a Other: 1 patient with gynecologic malignancy of unknown primary and 3 patients with gastro-intestinal cancer.

^b For subjects (n = 185) who completed baseline and 1-month follow up surveys.

^c Minimally invasive surgery includes traditional and robotic-assisted laparoscopy.

^d Including chemotherapy, radiation, or hormonal therapy. NA: not applicable, refers to benign disease patients.

^e Major comorbidity included: diabetes, history of venous thromboembolism or stroke, chronic renal disease, immunosuppression, or cardiac disease (excluding hypertension).

this cohort were slightly higher than average. Mean vaginal discomfort score was lower than average, and mean lubrication level score was at population average. Overall, women also reported lower levels of interest in sexual activity.

A clinically significant change in sexual interest was noted after surgery, as reported in Table 2. From baseline (preoperative) to 1-month after surgery, sexual interest scores decreased 3.5 points, to 41.3. This corresponds to nearly a full standard deviation (SD = 10) below population average (50). From one-month to three-months, the mean score increased 4.5 points (1.0 points above baseline). And at six-months, the mean increased slightly (1.4 points) again, to 2.4 points above baseline. The final sexual interest mean score of 47.2 fell within range (<1/2 SD) of population average norms of 50. These changes from baseline are all within the MID for this scale; however, the change between one-month and six-month scores was 5.9 points, which represents a clinically meaningful improvement.

When looking at the individual categories of response, the proportion of women with no sexual interest (response: “not at all”) went from 43% at baseline, up to 55% at one-month, and then down to 33% at three-months and 28% by six-months after surgery. For the question regarding sexual desire, the results for women who “never” wanted to have sex followed a similar trend: 30% at baseline, 43% at one-month, 29% at three-months and down to 23% by six-months after surgery.

Table 2
PROMIS-SFQ interest in sexual activity subdomain (N, % unless otherwise indicated).

Question	Baseline N = 185	1-month N = 185	3-months N = 169	6-months N = 172
Interest in sexual activity (mean ± SD)	44.8 ± 10.2	41.3 ± 8.9	45.8 ± 10.4	47.2 ± 10.2
“How interested have you been in sexual activity?”				
Not at all	79(43)	101 (55)	56 (33)	48 (28)
A little bit	24(13)	26 (14)	26 (15)	24 (14)
Somewhat	34(18)	28 (15)	34 (20)	39 (23)
Quite a bit	20(11)	11 (6)	24 (14)	26 (15)
Very	11(6)	3 (2)	12 (7)	13 (8)
Missing/no answer	17(9)	16(9)	17(10)	22 (13)
“How often have you felt like you wanted to have sex?”				
Never	56(30)	80 (43)	49 (29)	39 (23)
Rarely	27(15)	36 (20)	26 (15)	29 (17)
Sometimes	62(34)	35 (19)	51 (30)	51 (30)
Often	56(30)	15 (8)	20 (12)	25 (15)
Always	7(4)	2 (1)	4 (2)	5 (3)
Missing/no answer	18(10)	17(9)	19 (12)	23 (13)

Overall, interest in sexual activity and the desire to engage in sexual activity improved over the six-month postoperative period (Table 2).

The trends of sexual interest and desire were plotted over time, and stratified by specific clinical groups (Fig. 1): final pathology, surgery type, postoperative complication, and age. The trends were similar across most groups, with interest and desire decreasing at the one-month follow up and steadily increasing to above baseline by the six-month follow up. On bivariate analysis of final pathology, surgery type, and postoperative complication, there were no statistically significant differences in the magnitude of change between baseline and one-month postoperative scores (Table 3). We chose to analyze the change between baseline and one-month as this was the only interval of time in which a decrease in sexual interest and desire was appreciated. Age, as a proxy for menopausal status, however, was associated with a significant change in sexual interest. Women younger than 55 years of age had a greater decrease in sexual interest from baseline to one-month when compared with women older than 55 years of age: decrease of 5.5 points (± 1.0) compared to 2.3 points (± 0.9), (p = 0.02).

We performed a multivariable analysis incorporating cancer diagnosis, minimally invasive surgery, cancer site, and age. Age <55 years and a diagnosis of cancer were associated with significant decreases in sexual interest at one month after surgery. Women <55 years had an adjusted mean decrease in sexual interest of 4.6 points (95% CI: -1.8, -7.4) compared to ages >55. Women with cancer diagnosis had an adjusted mean decrease of 5.6 points (95% CI: -9.6, -1.5) compared to benign diagnoses (Supplemental Table 1).

4. Discussion

This study provides new data regarding the timing and magnitude of changes in sexual interest and desire following gynecologic oncology procedures. Notably relevant to pre-operative counseling, pre-menopausal age was associated with a greater temporary decline in sexual interest and desire one-month after surgery. Increasing awareness of the impact of surgery on sexual interest and desire in this population can improve care and counseling in the perioperative setting. Furthermore, the findings from this study can provide reassurance to women planning surgery for suspected gynecologic malignancy that their sexual interest is likely to be the same or improved after they make a full recovery.

Despite an initial drop in sexual interest and desire at the one-month postoperative time point, patients' sexual interest improved to a level above baseline by the six-month postoperative time point. Carter et al. evaluated the effect of surgery in women with cervical cancer over a

Trend in Sexual Interest Following Surgery

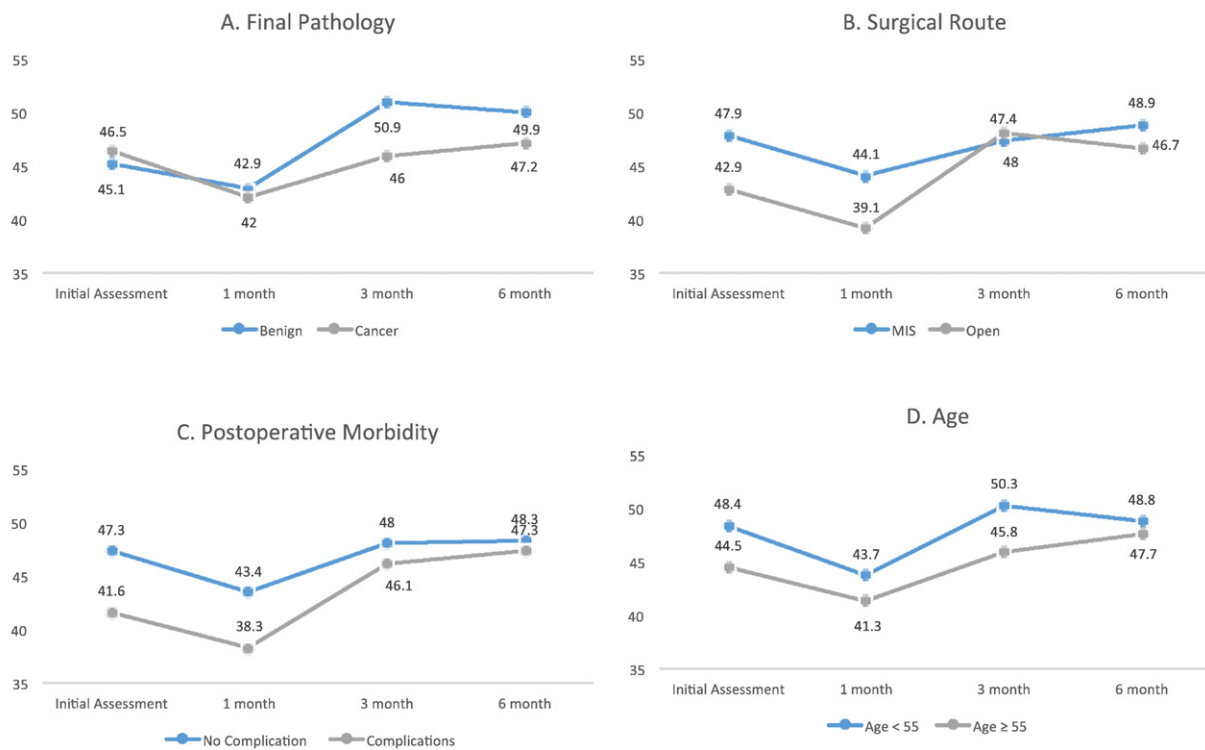


Fig. 1. Trend in Sexual Interest Following Surgery.

two-year period (at baseline and at 3, 6, 12, 18 and 24-month intervals) and similarly noted sexual dysfunction at baseline, which improved overtime to above baseline [11]. One explanation for post-operative scores that were higher than baseline is that the baseline scores are temporarily lowered as the preoperative period represents a time of stress and anxiety with a new or potential cancer diagnosis. Then, as time from surgery elapses and patients continue to heal from surgery, anxiety decreases, energy levels increase, and outlook regarding prognosis improves. All of these factors may in turn lead to improved sexual interest. It is important to note that by nature of enrollment at the time of the new patient visit, we cannot account for how an impending cancer diagnosis affected these baseline scores. This is an unavoidable limitation of studying this population as their need for surgery defined their inclusion in the study; however, the longitudinal nature of the data can still allow for trends over time. So, despite the potential for a falsely low baseline sexual interest secondary to pre-operative anxiety, the

Table 3
Change in PROMIS-SFQ interest in sexual activity subdomain between baseline scores and 1-month postoperatively.

	N (%)*	Δ mean \pm SE	p
Age			0.02
<55	72(47)	-5.5 \pm 1.0	
\geq 55	80(53)	-2.3 \pm 0.9	
Final pathology			0.1
Benign	48(29)	-2.2 \pm 1.0	
Cancer	104(71)	-4.6 \pm 0.9	
Route of surgery			0.9
MIS	100(66)	-3.9 \pm 0.9	
Laparotomy	52(34)	-3.7 \pm 0.9	
Postoperative morbidity			0.9
No complication	117(77)	-3.8 \pm 0.8	
Complication	35(23)	-4.0 \pm 1.4	

* "N" excludes non-responders.

longitudinal data still demonstrated further decreases at one-month, followed by increases. The result that scores returned to above baseline may actually be a return to the true baseline before even the need for surgery arose in these women.

Unique to this study, we noted a significant decrease in sexual interest and desire from baseline to one month postoperatively in women <55 years of age compared to women \geq 55 years of age. This age was chosen as a proxy for menopausal status. The physiologic and hormonal changes associated with surgery, in particular bilateral oophorectomy, may have affected sexual interest less noticeably in older women compared to younger women, who had not yet undergone menopause. We consider these results preliminary, as due to the limited nature of the data from the parent study, we were unable to explore detailed differences by age, though we recognize that age and menopausal status are likely associated with important clinical differences in this population. For instance, we would expect that younger, premenopausal women would have higher rates of benign disease and thus might undergo more minimally invasive procedures. Conversely, older, postmenopausal women would likely have higher rates of ovarian cancer and thus undergo more open surgery. Future studies are needed to explore sexual health as it relates to age, cancer diagnosis and surgery.

Women with a final cancer diagnosis experienced less recovery of sexual interest, which might be explained by the underlying disease process associated with gynecologic cancers. For example, women with ascites from ovarian cancer may continue to experience ascites-related bloating postoperatively, which can in turn impact sexual interest and desire. Also, patients can suffer from a great deal of emotional distress stemming from many factors such as fear of cancer treatment, guilt associated with the cancer diagnosis, and stress on interpersonal relationships due to a change in dependency on family members. These emotional stressors can lead to anxiety and depression, which have been identified as causes of sexual dysfunction particularly in the realms of interest, desire, arousal, and orgasm [12]. These emotional

stressors may be the driving force behind the difference in baseline interest in sexual activity in this cohort and the US population average. Finally, women are specifically counseled by gynecologic oncology providers to avoid sex in the postoperative period due to concerns regarding surgical site healing, which may directly impact desire to have sex.

No significant difference in sexual interest was appreciated between women with different gynecologic cancer sites. This finding echoes that of Grimm et al. who also did not report a difference in sexual function 12-months following surgery when comparing endometrial, vulvar and cervical cancer patients [13]. Although the study was not designed to assess the effect of adjuvant therapy on perioperative sexual health, prior studies have investigated the effect of treatments such as chemotherapy, radiation or hormonal therapy on sexual function. For instance, chemotherapy can induce ovarian failure and has been associated with vaginal mucocytosis and vulvodynia [14,15]. Also, pelvic radiation therapy can lead to fibrosis and stenosis of vaginal tissue which affects sexual arousal and sensitivity in addition to vaginal caliber and thus the physical capacity to tolerate vaginal penetrative intercourse [16]. As these treatments are an important component of treatment of gynecologic cancers for many patients, it is important that the combined effect of surgery and adjuvant therapy be evaluated more thoroughly in future lines of research.

This study offers new information on the impact of surgery on sexual interest and desire in women with gynecologic cancer and is one of the only studies to evaluate the effect of surgery on sexual interest and desire in a cohort of women that includes ovarian cancer patients. This study's cohort included four different types of gynecologic cancers, which is more comprehensive than previously published studies [12, 13,17,18]. Strengths include a well-characterized, large cohort of women with patient-reported data collected pre-treatment with subsequent follow up at regular intervals. Standardized, validated questionnaires were administered by trained interviewers via computer-assisted telephone interviews that include real-time quality control features (e.g., logic and range checks). We used the PROMIS-SFQ questionnaire, which is a validated questionnaire developed specifically for the assessment of sexual function, which includes sexual interest.

Limitations of this study include its generalizability, which may be reduced as the study cohort was recruited from a single academic institution. Due to limitations of the study design, follow up data on sexual health included only sexual interest and desire rather than other aspects of sexuality. Further studies are needed to explore how other aspects of sexual health, such as arousal, satisfaction, orgasm and pain, are impacted by surgery for treatment of gynecologic cancer. Although the parent study did include details such as cancer stage, additional details of surgical intervention (e.g. oophorectomy), and adjuvant therapy, we were limited in the number of variables we could analyze; we chose surgical type, final diagnosis, post-operative complication, and age as these were categories with large enough groups to compare robustly. Baseline characteristics for patients who refused to participate in the study were not collected; therefore, there may be a difference between the baseline traits of women who decided to participate in the study versus those who did not, which reflects a potential selection bias. Small sample sizes for vulvar/vaginal and cervical cancer precluded our ability to detect differences between these groups and assess cancer site as a causal agent for change in sexual interest and desire. Lastly, the study's follow up period concluded at six-months, which is shorter than previously published studies, so we cannot comment on long term sequelae of surgery on these patients beyond six-months.

5. Conclusion

Sexual health is a very important component of gynecologic cancer patients' overall quality of life. Our results suggests that one component

of sexual health—sexual interest and desire—is significantly impacted by surgery in the postoperative period, especially in those patients who are younger than 55. Counseling on sexual health that women receive perioperatively may often be strictly related to avoidance of sexual activity in order to prevent complications (e.g. vaginal cuff dehiscence). Expanding this discussion to include expectations on sexual interest and desire may help, especially younger women, cope with changes after surgery and can help frame normal expectations for women during this difficult time of diagnosis and treatment.

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jgyno.2017.04.001>.

Conflict of interest

The authors report no conflict of interest.

References

- [1] E.K. Hill, S. Sandbo, E. Abramsohn, J. Makelarski, K. Wroblewski, E.R. Wenrich, et al., Assessing gynecologic and breast cancer survivors' sexual health care needs, *Cancer* 117 (12) (Jun 15 2011) 2643–2651.
- [2] M.L. Krychman, L. Pereira, J. Carter, A. Amsterdam, Sexual oncology: sexual health issues in women with cancer, *Oncology* 71 (1–2) (2006) 18–25.
- [3] D.W. Bruner, C.P. Boyd, Assessing women's sexuality after cancer therapy: checking assumptions with the focus group technique, *Cancer Nurs.* 22 (6) (Dec 1999) 438–447.
- [4] D.K. Tierney, Sexuality: a quality-of-life issue for cancer survivors, *Semin. Oncol. Nurs.* 24 (2) (May 2008) 71–79.
- [5] M.L. Stead, J.M. Brown, L. Fallowfield, P. Selby, Lack of communication between healthcare professionals and women with ovarian cancer about sexual issues, *Br. J. Cancer* 88 (5) (Mar 10 2003) 666–671.
- [6] S.J. Falk, D.S. Dizon, Sexual dysfunction in women with cancer, *Fertil. Steril.* 100 (4) (Oct 2013) 916–921.
- [7] S.T. Lindau, E.M. Abramsohn, A.C. Matthews, A manifesto on the preservation of sexual function in women and girls with cancer, *Am. J. Obstet. Gynecol.* 213 (2) (Aug 2015) 166–174.
- [8] K.M. Doll, E.L. Barber, J.T. Bensen, A.C. Snaveley, P.A. Gehrig, The health-related quality of life journey of gynecologic oncology surgical patients: implications for the incorporation of patient-reported outcomes into surgical quality metrics, *Gynecol. Oncol.* 141 (2) (May 2016) 329–335.
- [9] K.M. Doll, E.L. Barber, J.T. Bensen, M.C. Revilla, A.C. Snaveley, A.V. Bennett, et al., The impact of surgical complications on health-related quality of life in women undergoing gynecologic and gynecologic oncology procedures: a prospective longitudinal cohort study, *Am. J. Obstet. Gynecol.* 215 (4) (Oct 2016) (457.e1, 457.e13).
- [10] K.E. Flynn, L. Lin, J.M. Cyranowski, B.B. Reeve, J.B. Reese, D.D. Jeffery, et al., Development of the NIH PROMIS (R) sexual function and satisfaction measures in patients with cancer, *J. Sex. Med.* 10 (Suppl. 1) (Feb 2013) 43–52.
- [11] J. Carter, Y. Sonoda, R.E. Baser, L. Raviv, D.S. Chi, R.R. Barakat, et al., A 2-year prospective study assessing the emotional, sexual, and quality of life concerns of women undergoing radical trachelectomy versus radical hysterectomy for treatment of early-stage cervical cancer, *Gynecol. Oncol.* 119 (2) (Nov 2010) 358–365.
- [12] M. DeSimone, E. Spriggs, J.S. Gass, S.A. Carson, M.L. Krychman, D.S. Dizon, Sexual dysfunction in female cancer survivors, *Am. J. Clin. Oncol.* 37 (1) (Feb 2014) 101–106.
- [13] D. Grimm, A. Hasenburg, C. Eulenburg, L. Steinsiek, S. Mayer, S. Eltrop, et al., Sexual activity and function in patients with gynecological malignancies after completed treatment, *Int. J. Gynecol. Cancer* 25 (6) (Jul 2015) 1134–1141.
- [14] M.L. Krychman, J. Carter, C.A. Aghajanian, D.S. Dizon, M. Castiel, Chemotherapy-induced dyspareunia: a case study of vaginal mucositis and pegylated liposomal doxorubicin injection in advanced stage ovarian carcinoma, *Gynecol. Oncol.* 93 (2) (May 2004) 561–563.
- [15] T.M. De Pas, M. Mandala, G. Curigliano, F. Peccatori, Acute vulvar vestibulitis occurring during chemotherapy with cryptophycin analogue LY355703, *Obstet. Gynecol.* 95 (6 Pt 2) (Jun 2000) 1030.
- [16] K. Bergmark, E. Avall-Lundqvist, P.W. Dickman, L. Henningsohn, G. Steineck, Vaginal changes and sexuality in women with a history of cervical cancer, *N. Engl. J. Med.* 340 (18) (May 6 1999) 1383–1389.
- [17] K. Abbott-Anderson, K.L. Kwekkeboom, A systematic review of sexual concerns reported by gynecological cancer survivors, *Gynecol. Oncol.* 124 (3) (Mar 2012) 477–489.
- [18] M. Grumann, R. Robertson, N.F. Hacker, G. Sommer, Sexual functioning in patients following radical hysterectomy for stage IB cancer of the cervix, *Int. J. Gynecol. Cancer* 11 (5) (Sep–Oct 2001) 372–380.