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Does vaginal size impact sexual activity and function?

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Abstract

Introduction and hypothesis—This study seeks to determine if total vaginal length (TVL) or genital hiatus (GH) impact sexual activity and function.

Methods—Heterosexual women ≥ 40 years were recruited from urogynecology and gynecology offices. TVL and GH were assessed using the Pelvic Organ Prolapse Quantification exam. Women completed the Female Sexual Function Index (FSFI) and were dichotomized into either normal function (FSFI total > 26) or sexual dysfunction (FSFI ≤ 26).

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Additional study sites: Hartford Hospital, Hartford, CT; Urogynecology Specialists, Louisville, KY; Cleveland Clinic, Weston, FL; Mount Sinai Hospital, New York, NY; Stony Brook University Medical Center, Stony Brook, NY

Results—Five hundred five women were enrolled; 333 (67%) reported sexual activity. While sexually active women had longer vaginas than women who were not active ($9.1 \text{ cm} \pm 1.2$ versus $8.9 \text{ cm} \pm 1.3$, $p=0.04$), significance was explained by age differences. GH measurements did not differ ($3.2 \text{ cm} \pm 1.1$ versus $3.1 \text{ cm} \pm 1.1$, $p=0.58$). In sexually active women, TVL was weakly correlated with FSFI total score, but GH was not. TVL and GH did not differ between women with normal FSFI scores and those with sexual dysfunction.

Conclusions—Vaginal size did not affect sexual activity or function.

Keywords

Sexual activity; Sexual function Vaginal anatomy; Total vaginal length; Genital hiatus; Questionnaires

Introduction

Vaginal measures are known to range in the general gynecologic population. A large epidemiological study of gynecological patients reported a mean total vaginal length (TVL) of 9.6 cm and mean genital hiatus (GH) of 2.9 cm [1]. However, anatomy and function of the vagina are not synonymous and the relationship of these measurements to sexual function is unknown.

This question is particularly relevant to pelvic reconstructive surgeons as many of these women may be experiencing pelvic organ prolapse and considering surgery [2]. The challenge of reconstructive surgery is to restore function through the correction of anatomical defects. Vaginal size and caliber were previously used as surrogate measures of sexual function following reconstructive surgery but have not previously been found to be predictive of sexual health with validated measures [3,4]. While prior practices that constricted the vaginal opening such as levatoroplasty have largely been abandoned [5,6], many reconstructive surgeries result in shortening of vaginal length and narrowing of the genital hiatus in an effort to correct symptoms of pelvic organ prolapse.

The aim of this study was to use standard, validated exam measurements and questionnaires to determine if sexual activity and function are correlated with vaginal length and caliber. Specifically, we sought to determine if TVL or GH impact sexual activity status and function as measured by the Female Sexual Function Index (FSFI).

Materials and methods

This is a secondary analysis of a prospective cohort study. Between September 2007 and April 2009, women 40 years of age or older were recruited prospectively from urogynecology and general gynecology offices at 11 sites in the United States. Women were eligible for the study if they were heterosexual, English-speaking, and had not had prolapse surgery within the past 6 months. Institutional Review Board approval was obtained at all sites, and all women gave written informed consent.

Data were abstracted from the patient's initial office visit including demographic information, medical history, surgical history, menopausal status, and relationship status. TVL and GH were assessed using the Pelvic Organ Prolapse Quantification exam [7] and urinary incontinence by the Incontinence Severity Index (ISI) with a score >1 on question 1 or a positive cough stress test on exam indicating incontinence for this study [8].

At their initial visit, all participants completed the Female Sexual Function Index, a 19-item validated questionnaire used to evaluate sexual function in women [9]. Higher scores

indicate better sexual function [9]. Possible total FSFI scores range from a low of 2 to a high of 36 [9]. A subsequent study further analyzed the data from 568 women using receiver–operator curves in addition to classification and regression tree analysis to develop a cutoff score of 26 predictive for sexual dysfunction [10]. Definitions of sexual dysfunction included female sexual arousal disorder, hypoactive sexual desire disorder, female sexual orgasm disorder, dyspareunia/vaginismus, and several others. For our analysis, women were grouped by total FSFI scores into a normal function group (FSFI total score >26) and those with sexual dysfunction (FSFI ≤26) [10]. Subanalyses of the desire, arousal, lubrication, orgasm, satisfaction, and pain domains of the FSFI were also performed.

Comparisons between groups for continuous responses were conducted using independent Student *t* tests. Categorical responses were compared using χ^2 and Fisher's exact tests where appropriate. Regression analysis was used to adjust for observed differences between the groups. Pearson's correlations were used to assess correlations between FSFI scores and vaginal dimensions. Multivariable logistic and linear regressions were used to identify factors associated with sexual activity, sexual function, and decreased FSFI scores. Missing data were assumed missing at random and not associated with the outcomes of this study. All reported *p* values were two-sided, and *p* values < 0.05 were considered statistically significant. Results are presented as percentages or as means ± standard deviations. Statistical analysis was done using Stata version 10.0 (StataCorp LP, College Station, TX, USA).

Results

A total of 656 women were approached for enrollment, and 505 (77%) women met eligibility criteria and were included in this analysis. Mean age was 53.6±10.8 years, and 333 (67%) reported sexual activity. TVL ranged from 5 to 13 cm, and GH ranged from 0.5 to 7 cm. Nine women had TVL shorter than 7 cm. Women who were sexually active were significantly younger, healthier, and had a lower body mass index (BMI) than women who were not sexually active (see Table 1). In addition, they were less likely to be postmenopausal, but more likely to be married or in a committed relationship. There was a lower rate of prior hysterectomy among sexually active women but no difference in history of prior pelvic reconstructive or incontinence procedures (Table 1). While urinary incontinence was more likely in women who were not sexually active, findings of vaginal prolapse on exam were not different between groups as measured by validated measures.

While sexually active women had longer vaginas than women who were not active (9.1±1.2 cm versus 8.9±1.3 cm, *p*=0.04, see Table 1), the difference was small and the significance was explained by differences in patients' age in multivariable analysis. GH measurements were likewise not different between groups (see Table 1). On multivariable analysis incorporating all factors that were different between the two groups into the model (Table 1), increasing age, increasing BMI, lack of a committed relationship, and presence of medical comorbidities remained significant predictors of sexual inactivity. In our model, increasing age and lack of a committed relationship were the strongest predictors of sexual inactivity (both *p*≤0.001).

Among the 333 women who were sexually active, FSFI scores were available for 327 (98%). Of these, 165 women (50.5%) reported normal total FSFI scores (>26) while 162 (49.5%) fell below the cutoff for sexual dysfunction (see Table 2). Women with normal FSFI scores were younger (49.1±8.5 years versus 53.7±8.9, *p*<0.0001) and less likely to be postmenopausal (39.4% versus 66.1%, *p*<0.0001) than women who had total FSFI scores ≥26. Women with normal sexual function were also less likely to report a history of any prior pelvic surgery (21.8% versus 32.1%, *p*=0.04), prior prolapse repair surgery (4.3%

versus 13.6%, $p=0.003$) and prior BSO (7.9% versus 16.8%, $p=0.02$). Complaints of urinary incontinence (40.2% versus 41.4%, $p=0.84$) or pelvic organ prolapse (42.4% versus 45.9%, $p=0.52$) were not different between groups.

TVL measurements did not differ between women who reported normal FSFI scores and women who fell below the cutoff for sexual dysfunction (see Table 2). Similarly, GH measurements were also not different between women with normal sexual function versus those with sexual dysfunction. When comparing groups with regard to the FSFI function cutoff score, only age remained a significant predictor of sexual function on multivariable analysis. For this model, we incorporated variables that were significant on univariate analysis such as age and prior prolapse surgery.

When evaluating total and subscale FSFI scores as continuous measures among sexually active women, increasing vaginal length was positively, but weakly, correlated with increased FSFI scores. This relationship was seen for the total FSFI score ($r=0.122$, $p=0.027$) and the lubrication ($r=0.172$, $p=0.002$) subscale, although correlations were low. Desire, arousal, orgasm, pain, and satisfaction subscales were not significantly correlated with FSFI scores. After adjusting for age, vaginal length remained a significant predictor of poorer FSFI scores only on the lubrication subscale ($p=0.031$). No correlation was seen with GH size and FSFI scores ($r=0.03$, $p=0.59$).

We examined mean FSFI scores in the sexually active women in this population by TVL quartiles (Table 3). There was no significant difference ($p=0.99$).

Multivariable analysis was performed to identify significant predictors of poor FSFI scores in sexually active women. The model included variables that were significantly different between the groups on univariate analysis, which included age and prior prolapse surgery. Only increasing age and a history of prior pelvic reconstructive surgery remained significant predictors of poor FSFI scores.

Vaginal length was significantly shorter in women with a history of either prior pelvic reconstructive surgery or prior hysterectomy (see Table 4). This effect was seen regardless of sexual activity status. The relationship between shorter vaginal length and a history of these surgical procedures remained significant after adjusting for age. There was no difference in genital hiatus based upon prior surgical procedures.

Discussion

Vaginal length and caliber did not affect rates of sexual activity or sexual function scores within broad parameters of normal in a large cohort of women.

We did find that sexually active women had longer TVL than women who were not sexually active, but the difference was minimal and not likely clinically significant. This is similar to past studies [3]. After controlling for age, the effect was no longer significant. Although we found increasing FSFI scores to be correlated with increasing TVL, the strength of the correlation was weak and suggests that this also may not be clinically relevant. There may be a threshold TVL above which sexual activity and function do not change, but we did not have enough women with shortened vaginas to evaluate this.

We found increasing age, increasing BMI, lack of a committed relationship, and presence of medical comorbidities to be significant predictors of sexual inactivity. Our findings regarding BMI are consistent with other reports [3], but the difference in BMI between the groups in our population was smaller than reported in that study. Addition of relationship information is a unique aspect of our study compared to previous reports on vaginal

anatomy [3,4] and is an interesting dimension to this aspect of a woman's decision to be sexually active. Medical comorbidity information is also previously understudied.

Prolapse and urinary incontinence did not affect rates of sexual activity in this cohort after multivariable analysis, supporting the combination of patients with and without these conditions for analysis as a single cohort in this study. The findings regarding sexual activity with patients with these pelvic floor conditions are consistent with prior studies [2]. As age remained, the most significant predictor of sexual inactivity, the effect seen on univariate analysis may have reflected higher rates of urinary incontinence in older women.

The effect of prior surgery on this cohort of women is important. Prior surgery predicted shorter TVL and also lower levels of sexual function based on FSFI scores on multivariate analysis, which has also been found in other studies using the FSFI [11]. We attempted to control for the possible connection of surgical history to older age in our multivariable model and the effect of prior surgery persisted for diminished sexual function. In women who were sexually active, a shortening effect of prior surgery on TVL, whether hysterectomy or reconstructive surgery, was noted and is similar to that reported in prior studies [4] but different from others [12]. While we would not expect changes in GH from hysterectomy alone, it is also interesting to note that pelvic reconstructive surgery also did not affect GH.

While prior prolapse surgery was shown to decrease TVL and was associated with decreased sexual function, shorter TVLs were not associated with a change in sexual activity or function. This raises the question of other possible effects of prolapse surgery that result in diminished function such as scar tissue, vaginal wall compliance changes, use of mesh or permanent suture, body image concerns, or the caliber of the vagina above the level of the genital hiatus. As prior hysterectomy alone was not associated with diminished sexual function, this effect of surgery on poorer sexual function scores appears specific to prolapse surgery.

Nonetheless, the 67% rate of sexual activity in our study group is higher than some studies of women with prolapse [2,4] and more consistent with others that includes a general gynecology population [3]. We question whether prolapse may be a determining factor in sexual activity rather than simply vaginal dimensions.

The strengths of our study include that it was multicenter and included a diverse population of women presenting for routine gynecological exams rather than only women presenting for subspecialty evaluation. We used validated questionnaires and a standardized examination to determine both sexual function and vaginal anatomy. We saw a wide range of vaginal lengths and genital hiatus measurements, but had few women with very short vaginas or narrow openings, which may limit our ability to determine the overall impact of vaginal size outside the normal range.

Our study is limited by its design as an observational study, making it difficult to draw concrete conclusions about changes over time. Future areas of study may further investigate the immediate effects of surgery on sexual activity and function, although this may neglect women who choose nonsurgical treatments. We were only able to study English-speaking heterosexual women because of the measures available, which limits our ability to generalize our results to other women but provides avenues for future study. As well, we used the validated FSFI cutoff score of 26 in our analysis, which may limit our ability to draw clinical conclusions from a more statistically derived delineation between normal and abnormal sexual function. While the FSFI was not originally designed as a diagnostic tool to identify sexual dysfunction, which may be multifactorial, it has been used in other studies in the urogynecologic population for this purpose [13,14]. The FSFI validation population had

a younger mean age than did our study and included more premenopausal patients [10], although the extensive validation process that also incorporated a control population supports our use in this population. Because of this, we also looked at rates of sexual activity and correlations between FSFI scores as well as dichotomizing our population into those with normal and sexual dysfunction. Results from these additional investigations support the differences found.

In conclusion, vaginal dimensions including TVL and GH, impact sexual activity and function less than age within broad parameters of normal in a large cohort of women.

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References

1. Swift S, Woodman PL, O'Boyle A, Kahn M, Valley M, Bland D, et al. Pelvic Organ Support Study (POSST): the distribution, clinical definition, and epidemiologic condition of pelvic organ support defects. *Am J Obstet Gynecol.* 2005; 192:795–806. [PubMed: 15746674]
2. Weber AM, Walters MD, Schover LR, Mitchinson A. Sexual function in women with uterovaginal prolapse and urinary incontinence. *Obstet Gynecol.* 1995; 85(4):483–487. [PubMed: 7898820]
3. Weber AM, Walters MD, Schover LR, Mitchinson A. Vaginal anatomy and sexual function. *Obstet Gynecol.* 1995; 86:946–949. [PubMed: 7501345]
4. Weber AM, Walters MD, Piedmonte MR. Sexual function and vaginal anatomy in women before and after surgery for pelvic organ prolapse and urinary incontinence. *Am J Obstet Gynecol.* 2000; 182:1610–1650. [PubMed: 10871485]
5. Jeffcoate TN. Posterior colporrhaphy. *Am J Obstet Gynecol.* 1959; 77:490–502. [PubMed: 13627047]
6. Francis WJ, Jeffcoate TN. Dyspareunia following vaginal operations. *J Obstet Gynaecol Br Commonw.* 1961; 68:1–10. [PubMed: 13701244]
7. Bump RC, Mattiasson A, Bo K, Brubaker LP, DeLancey JO, Klarskov P, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol.* 1996; 175:10–17. [PubMed: 8694033]
8. Hanley J, Capewell A, Hagen S. Validity study of the severity index, a simple measure of urinary incontinence in women. *Br Med J.* 2001; 322:1096–1097. [PubMed: 11337439]
9. Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, et al. The female sexual function index (FSFI): a multidimensional self-report instrument for assessment of female sexual function. *J Sex Marital Ther.* 2000; 26:191–208. [PubMed: 10782451]
10. Wiegel M, Meston C, Rosen R. The female sexual function index (FSFI): cross-validation and development of clinical cutoff scores. *J Sex Marital Ther.* 2005; 31(1):1–20. [PubMed: 15841702]
11. Celik H, Gurates B, Yavuz A, Nurkalem C, Hanay F, Kavak B. The effect of hysterectomy and bilaterally salpingo-oophorectomy on sexual function in post-menopausal women. *Maturitas.* 2008; 61:358–363. [PubMed: 18977621]
12. Jewett JG. Vaginal length and incidence of dyspareunia following total abdominal hysterectomy. *Am J Obstet Gynecol.* 1952; 63(2):400–407. [PubMed: 14894551]
13. Murina F, Bernorio R, Palmiotto R. The use of Amielle vaginal trainers as adjuvant in the treatment of vestibulodynia: an observational multicentric study. *Medscape J Med.* 2008; 10(1):23. [PubMed: 18324333]
14. Fitzgerald MP, Link CL, Litman HJ, Travison TG, McKinlay JB. Beyond the lower urinary tract: the association of urologic and sexual symptoms with common illnesses. *Eur Urol.* 2007; 52(2): 326–330. [PubMed: 17467887]

Table 1

Demographics

Variable	Sexually active women (n=333)	Sexually inactive women (n=172)	p value
Mean age (years)	51.5±9.1	58.0± 11.0	<0.0001
Mean body mass index (BMI)	28.0±6.6	30.1±7.7	0.008
Race/ethnicity			0.65
White	230 (69.1%)	113 (65.7%)	
African American	59 (17.7%)	33 (19.2%)	
Other	12 (3.6%)	6 (3.5%)	
Parity	2.4±1.5	2.2±1.8	0.18
Postmenopausal	175 (52.6%)	120 (73.6%)	<0.0001
Use of estrogen therapy	52 (15.6%)	28 (16.3%)	0.46
Any prior pelvic surgery	89 (26.7%)	57 (34.9%)	0.058
Prior hysterectomy	77 (23.2%)	54 (33.3%)	0.017
Prior prolapse surgery	29 (8.8%)	23 (14.1%)	0.069
Prior incontinence surgery	25 (7.5%)	23 (14.1%)	0.118
Prior BSO	41 (12.4%)	27 (16.8%)	0.191
Relationship status			<0.001
Single	42 (12.7%)	102 (62.6%)	
Married	234 (70.7%)	53 (32.5%)	
Committed relationship	55 (16.6%)	8 (4.9%)	
Other medical problems ^a	111 (33.4%)	95 (58.3%)	<0.0001
Depression	57 (17.2%)	36 (22.2%)	0.177
Urinary incontinence (any type)	137 (41.3%)	89 (54.9%)	0.004
Pelvic organ prolapse stage:			0.16
0–1	185 (55.7%)	80 (49.1%)	
2	107 (32.2%)	66 (40.5%)	
3	30 (9.1%)	12 (7.3%)	
4	10 (3.0%)	5 (3.1%)	
Mean TVL	9.1 cm±1.2	8.9 cm±1.3	0.04
Mean GH	3.2 cm±1.1	3.1 cm±1.1	0.58

^aIncluded hypertension, diabetes mellitus, coronary artery disease, cerebrovascular disease, and multiple sclerosis

Table 2

Vaginal measurements in women with normal and low FSFI scores among sexually active women

Domain	Normal sexual function (FSFI>26; n=165)	Sexual dysfunction (FSFI≤26; n=162)	p value
TVL	9.2 cm±1.2	9.0 cm±1.2	0.08
GH	3.2 cm±1.0	3.1 cm±1.1	0.26

Table 3

Mean FSFI scores based on TVL by quartile

Quartile	TVL	Mean FSFI score at that TVL
1%	≤6 cm	22.70±15.09
25%	8 cm	22.75±8.46
50%	9 cm	25.48±8.65
75%	10 cm	24.15±8.96
99%	≥12 cm	23.42±9.86

Table 4

Effect of surgery on vaginal length and genital hiatus

	Hysterectomy	Intact uterus	<i>p</i> value	Pelvic reconstructive surgery	No prior pelvic reconstructive surgery	<i>p</i> value
Total vaginal length						
Overall	8.3±1.2	9.3±1.2	<0.0001	7.8±1.2	9.2±1.2	<0.0001
Sexually active women	8.5±1.1	9.3±1.2	<0.0001	7.9±1.0	9.2±1.2	<0.0001
Genital hiatus						
Overall	3.2±1.1	3.2±1.1	0.854	3.4±1.1	3.2±1.1	0.213
Sexually active	3.2±1.2	3.2±1.0	0.552	3.4±1.1	3.2±1.1	0.193