ORIGINAL RESEARCH—WOMEN'S SEXUAL HEALTH

Biologic Correlates of Sexual Function in Women with Stress Urinary Incontinence

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ABSTRACT

Introduction. Stress urinary incontinence (SUI) has a great impact on the quality of life and sexual function. We hypothesized that specific risk factors for SUI may be correlated with reduced sexual function in women with SUI.
Aims. To explore significant associations between the risk factors for SUI and female sexual function.
Methods. Women with SUI (N = 223) were surveyed about their sexual function. Demographic data and clinical findings on pelvic examination and the 1-hour pad test were recorded. Sexually active respondents completed the short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12).
Main Outcome Measure. PISQ-12 and the correlation of the risk factors for SUI with PISQ-12 scores.
Results. Of the 223 subjects, 68 (30%) reported no sexual activity for 6 months or more prior to the interview and did not respond to the PISQ-12. In comparison with the 155 (70%) of women who were sexually active, sexually inactive respondents were older and more likely to be postmenopausal and had a higher parity and more severe prolapse (all $P < 0.01$). Among those completing the PISQ-12 questionnaire, the same factors (age, parity, severity of prolapse, menopausal status) were significantly associated with lower PISQ-12 scores. The scores were not correlated with body mass index, delivery mode, genital hiatus length, and total vaginal length by the short form of the Pelvic Organ Prolapse Quantification (POP-Q) system, or estrogen therapy. Lower points Ba and C of the POP-Q system were associated with lower PISQ-12 scores ($r = -0.200$, $P = 0.026$; $r = -0.191$, $P = 0.035$, respectively). Multivariate analysis identified parity as the only factor independently predictive of sexual dysfunction ($r = -0.225$, $P = 0.013$).
Conclusions. Anatomic and biologic pathology does not satisfactorily predict the level of sexual functioning in women with SUI. **Yang S-H, Yang J-M, Wang K-H, and Huang W-C. Biologic correlates of sexual function in women with stress urinary incontinence. J Sex Med 2008;5:2871–2879.**

Key Words. Risk Factor; Sexual Activity; Stress Urinary Incontinence

Introduction

Female sexual dysfunction is an important quality of life issue affected by a variety of factors, ranging from psychologic and relationship concerns to physical problem [1]. Stress urinary incontinence (SUI), a prevalent disease throughout the world, may have a great impact on the quality of life and of sexual functioning [2–11]. The reported incidence of female sexual dysfunction in women with SUI ranges from 26% to 47% [2,4]. Some reasons for this dysfunction include anxiety about urinary leakage during intercourse, dyspareunia caused by urine dermatitis of the vulvovestibule, a diminished degree of self-esteem, and decreased libido [3–6,10,12].

Vaginal childbirth, high parity, obesity, aging, menopausal status, and genitourinary prolapse

are all risk factors for SUI [13–15]. Modification of these risk factors might therefore prevent or lessen the impact from SUI. Indeed, measures such as cesarean delivery for multiple births [16], reduction in body weight [17,18], and pelvic floor muscle reeducation and training [19] have all been suggested to prevent or ameliorate SUI [15].

Aims

The aim of this study was to explore specific associations between risk factors for SUI and female sexual function based on an assumption that particular risk factors for SUI can aggravate sexual function, whereas modifying these risk factors may improve quality of life and female sexual function as well.

Methods

From January 2005 to December 2007, women who visited urogynecology clinics of two medical centers for bothersome lower urinary tract symptoms were invited to complete a survey of the impact of female lower urinary tract symptoms as a routine workup after a complete urodynamic study. The survey assessed incontinence symptoms, quality of life, and quality of sexual life using the following questionnaires: short form of the Urogenital Distress Inventory (UDI-6), short form of the Incontinence Impact Questionnaire (IIQ-7) [20], and Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) [21]. The PISQ-12 served as a measure of sexual function and was completed only by women who were sexually active within the 6 months prior to the study. After obtaining oral informed consents and following a full explanation and instructions, each questionnaire was completed by the patient without assistance from the physicians or research assistants administering the study. High UDI-6 and IIQ-7 scores reflect a worse perception of the quality of life and social function, and low PISQ-12 scores indicate poor sexual functioning [21,22]. Subjects who had urinary tract infection, diabetes mellitus, cerebrovascular disease, dementia, or overt neurologic disease and who previously had undergone pelvic floor reeducation program were excluded from the study. Approval to carry out the study was obtained from the local ethics committee.

The following information was also recorded: demographic data, obstetric history including mode of each delivery, and the results of a pelvic examination and 1-hour pad test, a test recommended by the International Continence Society (ICS) for semiquantitative analysis of urine loss [23]. Pelvic examination was performed using a split speculum with patients in the dorsal lithotomy position. Pelvic support was assessed when the patient was straining maximally. Site-specific analysis of pelvic organ prolapse was performed using the ICS Pelvic Organ Prolapse Quantification (POP-Q) system. The degree of pelvic organ prolapse was graded as stage 0 (no prolapse) to IV [24].

The study received review board approval from Mackay Memorial Hospital and Cathay General Hospital.

Statistical Analysis

Descriptive data are presented as mean and standard deviation. The Pearson correlation test or point-biserial correlation coefficient test was used to measure associations between PISQ-12 scores and independent variables. After univariate analysis, stepwise multivariate linear regression was used to identify factors independently predictive of low sexual functioning. All analysis was carried out using SPSS for Windows, release 15.0 (SPSS, Inc., Chicago, IL, USA). Because of close interrelationships among explanatory variables, no adjustment in the *P* value was made for multiple comparisons. A P value of <0.05 was considered significant for all analyses.

Main Outcome Measures

The main outcome measures for this study were the PISQ-12, a condition-specific validated questionnaire to assess the sexual function of women with SUI or pelvic organ prolapse or both, and the relationship between the risk factors for SUI and PISQ-12 scores.

Results

Urodynamic studies were performed to 644 women who had bothersome lower urinary tract symptoms. Of the 644 women, objective evidence of SUI was identified in 223 subjects (35%). Of the 233 subjects with urodynamic stress incontinence, 68 patients (30%) denied any sexual activity for 6 months or longer before the interview, leaving 155 (70%) sexually active women who completed the PISQ-12. Women who were sexually inactive were older, more likely to be postmenopausal, and had a higher parity and more severe genitourinary pro-

Table 1 Demographic and clinical characteristics of sexually active and inactive women with stress urinary incontinence

Variables	Sexually inactive	Sexually active	*P*
Number	68	155	
Age (years)	63.4 ± 10.3	47.8 ± 7.8	0.005
Postmenopausal	58 (85%)	55 (35%)	<0.001
Duration (months)	18 ± 8	5 ± 4	<0.001
Natural process	54 (79%)	49 (32%)	0.520
Surgical process	4 (6%)	6 (3%)	
Estrogen therapy*	10 (15%)	8 (5%)	0.032
Parity	3.8 ± 1.6	2.5 ± 1.1	<0.001
Body mass index (kg/m^2)	24.2 ± 4.7	24.5 ± 3.2	0.296
ICS staging of prolapse	1.9 ± 1.0	1.4 ± 0.7	<0.001
1-hour pad test (g)	30.3 ± 36.5	31.7 ± 31.4	0.302
UDI-6 scores	6.7 ± 4.7	7.6 ± 4.5	0.704
IIQ-7 scores	8.3 ± 6.3	8.0 ± 5.8	0.202

*Conjugated equine estrogen (0.625 mg) with or without 5 mg medroxyprogesterone acetate daily.
ICS = International Continence Society; UDI-6 = short form of Urogenital Distress Inventory; IIQ-7 = short form of Incontinence Impact Questionnaire.

lapse than the 155 who were sexually active. Statistically, however, the 1-hour pad test and UDI-6 and IIQ-7 scores did not differ significantly between the two groups (Table 1).

Of the 155 sexually active women, 15 (10%) had PISQ-12 scores of zero, 6 (4%) had ICS stage 0, 88 (57%) stage I, 51 (33%) stage II, and 10 (6%) stage III prolapse, with the severity of prolapse varying by vaginal wall compartments (Table 2). Of the 155 respondents, 9 had undergone total or subtotal hysterectomy; 15 other pelvic surgery, including total or partial oophorectomy and myomectomy; and 3 anti-incontinence operations (one needle suspension, one mid-urethral sling, and one anterior colporrhaphy). None had had posterior colporrhaphy.

There were modest correlations between PISQ-12 scores and UDI-6 and IIQ-7 scores ($r = 0.482$, $P < 0.001$ and $r = 0.420$, $P < 0.001$, respectively). There was also a weak but significant association between the PISQ-12 scores and 1-hour pad test results ($r = 0.177$, $P = 0.028$) (Figure 1).

Age, parity, menopausal status, and severity of prolapse were the demographic risk factors significantly correlated with PISQ-12 scores. Points Ba and C of POP-Q system were the only two anatomic risk factors significantly correlated with PISQ-12 scores. On multivariate linear regression analysis, parity was the only factor independently associated with sexual function (Table 3). Figure 2 demonstrates the distribution of PISQ-12 scores by the significant risk factors for SUI.

Discussion

In this study of women with SUI, older age, higher parity, menopause, and more severity of prolapse were predictive of poor sexual functioning. Of these, only parity was independently associated with sexual function. Anatomic and physiologic variables related to birth trauma, such as delivery mode and a lax vagina, were not significantly associated with sexual function.

Recent studies have clearly demonstrated the impact of urinary incontinence on sexual function [2–11], but the relevant pathophysiology is still unclear [4]. Our study is in agreement with others who have found that some but not all risk factors for SUI are associated with sexual function [25].

Table 2 Severity of defects in vaginal wall compartments by the International Continence Society staging system in 155 sexually active women with stress urinary incontinence

	Anterior compartment		Middle compartment	Posterior compartment	
	Aa	Ba	C	Ap	Bp
Stage 0	2%	2%	60%	18%	18%
Stage I	61%	73%	33%	66%	66%
Stage II	31%	23%	5%	16%	16%
Stage III	6%	2%	2%	—	—

Aa = a point located in the midline of the anterior vaginal wall 3 cm proximal to the external urethral meatus; Ba = a point that represents the most distal or most dependent position of any part of the upper anterior vaginal wall from the vaginal cuff or anterior vaginal fornix to point Aa; C = a point that represents either the most distal or most dependent edge of the cervix or the leading edge of the vaginal cuff (hysterectomy scar) after total hysterectomy; Ap = a point located in the midline of the posterior vaginal wall 3 cm proximal to the hymen; Bp = a point that represents the most distal or most dependent position of any part of the upper posterior vaginal wall from the vaginal cuff of posterior vaginal fornix to point Ap.

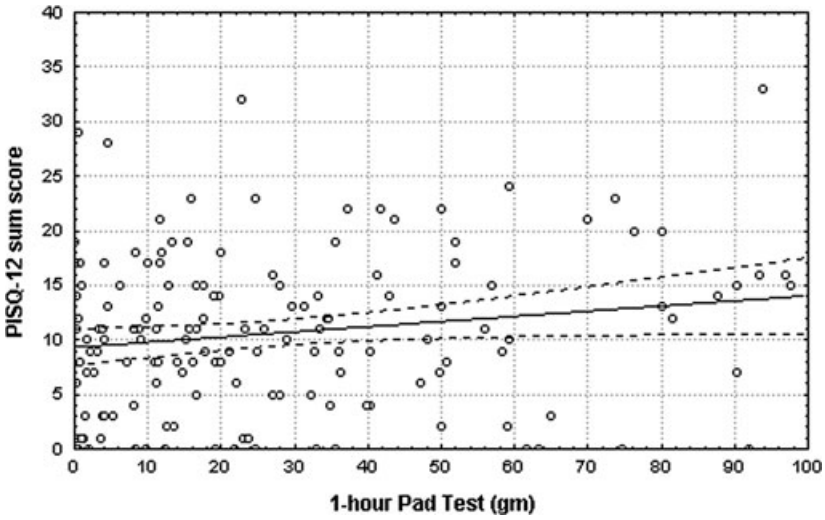

Figure 1 Association between 1-hour pad test results and Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) scores.

Aging and menopause are two irreversible biologic factors related to diminished sexual activity [1,5,26,27]. Dyspareunia caused by reduced vaginal lubrication and atrophic changes of vaginal epithelium because of estrogen depletion [28] and decreased interest are commonly responsible for decreased or absent sexual activity in postmenopausal women [5], a finding in various series affecting less than 10% to more than 40% of subjects [26].

High parity and pelvic organ prolapse were also associated with low sexual functioning. Pelvic floor relaxation and dysfunction may result from birth trauma during vaginal delivery or obesity or both [14]. We did not find any association between obesity and poor sexual functioning, which is in agreement with the findings of Morgan et al. [5]. As in the study by Botros et al. [29], parity was the only factor independently associated with sexual dysfunction in our study. Vaginal delivery per se,

Table 3 Effect of risk factors for stress urinary incontinence on total Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire scores

	Univariable analysis		Multivariable analysis	
Variable	*r*	*P*	*r*	*P*
I. Demographic				
Age	–0.201	0.018	0.000	0.977
Parity	–0.226	0.008	–0.225	0.013
Body mass index	0.026	0.770		
Menopause	0.007	0.938		
Menopause duration	0.055	0.747		
Estrogen therapy	–0.019	0.912		
Cesarean delivery	0.007	0.938		
II. Anatomic				
ICS prolapse staging	–0.258	0.003	–0.218	0.071
Point of prolapse measurement by POP-Q system				
GH	–0.135	0.134		
PB	0.021	0.820		
TVL	0.142	0.116		
Aa	–0.172	0.057		
Ba	–0.200	0.026	–0.105	0.800
Ap	–0.143	0.115		
Bp	–0.011	0.901		
C	–0.191	0.035	–0.134	0.212
D	–0.039	0.085		

ICS = International Continence Society; POP-Q = Pelvic Organ Prolapse Quantification; GH = genital hiatus length, measured from the middle of the external urethral meatus to the posterior midline hymen; PB = perineal body length, measured from the posterior margin of the genital hiatus to the midanal opening; TVL = total vaginal length, the greatest depth of the vagina when point C or D is reduced to its full normal position; Aa = a point located in the midline of the anterior vaginal wall 3 cm proximal to the external urethral meatus; Ba = a point that represents the most distal or most dependent position of any part of the upper anterior vaginal wall from the vaginal cuff or anterior vaginal fornix to point Aa; Ap = a point located in the midline of the posterior vaginal wall 3 cm proximal to the hymen; Bp = a point that represents the most distal or most dependent position of any part of the upper posterior vaginal wall from the vaginal cuff of posterior vaginal fornix to point Ap; C = a point that represents either the most distal or most dependent edge of the cervix or the leading edge of the vaginal cuff (hysterectomy scar) after total hysterectomy; D = a point that represents a location of the posterior fornix in a women who still have a cervix.

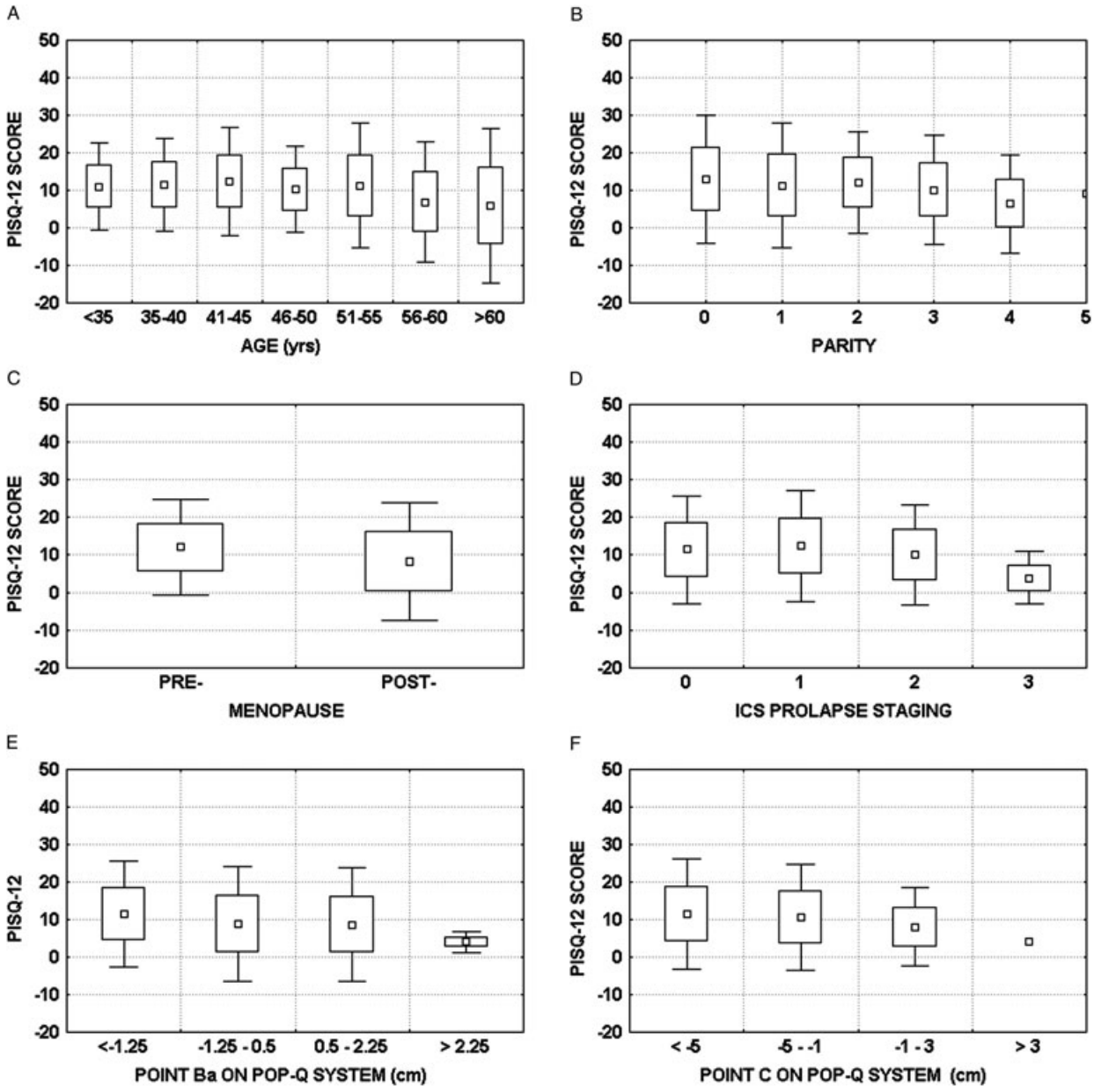

Figure 2 Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) scores by (A) age, (B) parity, (C) menopause status, (D) International Continence Society (ICS) prolapse staging, and (E) Ba and (F) C points of Pelvic Organ Prolapse Quantification (POP-Q) system. Open squares indicate the mean, bars show mean ± 1 standard deviation, and whiskers show mean ± 2 standard deviation.

however, was not significantly associated with poor sexual functioning. Findings in this regard have varied, with some investigators indicating that mode of delivery does [25,30–32] and other that it does not [29,33–35] affect sexual functioning. It has been reported that at 6 months follow-up, there is no difference with sexual coital frequency or satisfaction [33]. More specifically, we found that a wide genital hiatus or lax vagina, a morphologic indicator of pelvic floor relaxation or hypotonia commonly related to birth trauma [36,37], was not significantly associated with sexual function.

Although normative standards have not yet been well defined and are highly subjective, adequate vaginal length and caliber are minimum prerequisites for maintaining sexual function. In our study, prolapse of the anterior or middle vaginal compartment were associated with lower

PISQ-12 scores, but posterior vaginal prolapse was not. This may be because our subjects had only a mild or moderate degree of rectocele. Vaginal hyper- and hypotonia are other factors related to female sexual dysfunction [38]. Theoretically, hypotonia may result in decreased or absent activation of mechanoreceptors related to vaginal sensory perception during sexual activity, lessening satisfaction and thereby exacerbating female sexual dysfunction [39]. However, as noted above, a wide genital hiatus or lax vagina was not correlated with sexual function in our subjects. Moreover, even if the theory is correct in terms of causation, reconstructive surgery to decrease vaginal dimensions does not clearly improve sexual function [40].

Perhaps, these findings are not surprising, as overall sexual satisfaction is a complex matter not directly dependent on biologic factors alone [4,6,22,41–43]. For example, the psychosocial impact of childbirth, including multiparity, child rearing, and number of children, which increase the stress of parenting [29,44,45], reportedly plays a prominent role in sexual dysfunction or low sexual activity in incontinent women. This and other factors such as financial concern and privacy may influence sexual functioning long after the postpartum period and are eventually joined by other unavoidable factors such as age and menopause.

The PISQ-12 is a reliable, validated instrument for comparing sexual functioning of women with and without urinary incontinence and/or pelvic organ prolapse. It explores three domains: behavioral emotive, physical, and partner related [21]. Originally, PISQ-12 scores were reported to correlate negatively with IIQ-7, higher PISQ-12 scores indicating better sexual function and higher IIQ-7 scores reflecting poorer social functioning [22]. This inverse correlation was thought to be related to the physical factors in items 5 to 9 on the PISQ-12 scale [21]. However, we found that PISQ-12 scores were positively correlated with UDI-6 and IIQ-7 scores and the 1-hour pad test. Morgan et al. reported that sexual activity in women over 61 decreased with increased severity of SUI, but this relationship was not true in younger women [5]. In our study, 65% of sexually active respondents were premenopausal. Therefore, the interpretation of the relationship between the PISQ-12 score and the severity of SUI cannot be viewed in isolation; the impact of age and menopause should also be considered [1,5,26,27].

There are several limitations in this study. First, we did not assess the effect of individual items on the PISQ-12. Because sexual function is a complex interactive process involving psychologic, biologic, and relational issues, it is difficult to tease out the impact of individual variables on overall sexual activity [4]. Second, there may have been some bias in the responses, particularly as culture may impact a woman's views on and responses to questions about sexual activity [46]. We suspected that sexually inactive respondents, 30% of our study population, may include those who were nonrespondents. Nevertheless, the estimated response rate for this survey was above 70%. Third, some biologic factors such as the phase of menstrual cycle in premenopausal women, the level of hormonal milieu, and other comorbidities including chronic obstructive lung disease and pelvic floor neuropathy were not included in the analysis. In contrast, three women who had recurrent SUI after anti-incontinence operations were included. It was possible that such procedures may exert negative impact on female sexuality [22,47]. Thus, our study population was a convenience sample, which may affect the generalizability of the results. Fourth, biologic factors may not impact per se on women's sexual health but indirectly through an increase of depression and anxiety [30]. Lack of any tool dedicated to the investigation of mood deflection and, eventually, sexual disorder-driven women's distress is another limitation of this study. Additionally, women's relationship status and educational status, not considered in this study, are also potential confounding factors and may affect the outcomes. Lastly, this study was a cross-sectional study with no control group, a study design that does not allow for causal inferences about any associations between variables. Even if cause–effect relationships could be defined, that would still not constitute evidence that modification of any particular risk factor for SUI would succeed in improving quality of life and sexual function. Despite these limitations, our findings may be useful in counseling women considering surgical procedures to avoid or correct a lax vagina or vaginal hypotonia. Such procedures may not necessarily improve sexual function.

Conclusions

In women with SUI, age and menopause are irreversible biologic factors associated with sexual function. Parity and pelvic organ prolapse may also contribute to poor sexual function. Our findings suggest that sexual function should not be

assumed to be simply a product of anatomic, biologic, or physiologic process.

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Statement of Authorship

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