WOMEN'S SEXUAL HEALTH

Description of Vaginal Laxity and Prolapse and Correlation With Sexual Function (DeVeLoPS)

Allison Polland, MD,[1] Vi Duong, MD,[3,8] Rachel Furuya, BA,[2] Jocelyn J. Fitzgerald, MD,[4] Haijun Wang, MS,[5] Aya Iwamoto, MS, MD,[6] Sarah Bradley, MD,[7] and Cheryl B. Iglesia, MD[3]

ABSTRACT

Introduction: Vaginal laxity (VL) is a sensation of vaginal looseness which may develop after pregnancy and vaginal delivery and may be affected by prior pelvic surgery, menopause and aging. Pelvic organ prolapse (POP) is a disorder in which pelvic organs descend from the normal position. VL has attracted recent attention due to the advent of energy-based treatments for this symptom.

Aim: To determine the correlation between VL symptoms and physical exam findings of POP, specifically the introital measurement of genital hiatus.

Methods: This was a multi-center cross-sectional study of sexually active women over 18 years of age with a parity of one or greater. Subjects completed the Vaginal Laxity Questionnaire (VLQ), the Pelvic Floor Distress Inventory-20, and the Female Sexual Function Index (FSFI), and were asked if a sexual partner had commented on laxity. Subjects underwent pelvic exam, including the pelvic organ prolapse quantification (POP-Q).

Main Outcomes Measures: Correlation between VL symptoms as measured by the VLQ and POP as measured by elements of the POP-Q.

Results: A total of 95 subjects with an average age was 54.3 ± 13.18 years were included. Sixty-three percent of patients were postmenopausal. The average VLQ score was 4.2 ± 1.35 and the average FSFI score was 23.42 out of 36. There was no significant correlation between VLQ score and POP or mid-vaginal caliber. Sensation of vaginal tightness was significantly associated with age (P=0.03) and menopausal status (P=0.04). Only 28% of partners commented on laxity and the majority commented on the vagina being tight (21%) rather than loose (7%).

Conclusion: VL was not correlated with physical exam findings quantifying POP or sexual function. This study emphasizes the need to develop a more standardized definition of VL and a better assessment tool for VL symptoms. **Polland A, Duong V, Furuya R, et al. Description of Vaginal Laxity and Prolapse and Correlation With Sexual Function (DeVeLoPS). Sex Med 2021;9:100443.**

Key Words: Female Sexual Function Index; Pelvic Floor Distress Inventory; POP-Q; Vaginal Laxity Questionnaire; Vaginal Laxity

INTRODUCTION

Vaginal laxity is a sensation of looseness of the vagina which may develop after pregnancy and vaginal delivery, although it may also be affected by prior pelvic surgery, menopause, and aging. This symptom has been attracting recent attention due to the advent of nonsurgical energy-based treatments[1] and the new

Received March 10, 2021. Accepted September 1, 2021.

[1]Maimonides Medical Center, Brooklyn, NY;

[2]Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, New York, NY;

[3]Georgetown University School of Medicine/MedStar Health, Washington, DC;

[4]University of Pittsburgh Medical Center, Pittsburgh, PA;

[5]MedStar Health Research Institute;

[6]University of Iowa Hospitals and Clinics, Iowa City, IA;

[7]Mission Hospital, Ashville, NC;

[8]Massachussets General Hospital, Boston, MA

https://doi.org/10.1016/j.esxm.2021.100443

terminology by the International Urogynecological Association.[2] An international survey of urogynecologists found that the vaginal introitus was the most frequently cited location of laxity.[3] Vaginal laxity may cause decreased genito-pelvic sensation during sexual intercourse adversely impacting sexual quality of life.[4,5] Vaginal laxity is not well defined and likely underreported, resulting in a lack of data regarding the relationship between laxity and pelvic organ prolapse.[3] Pelvic organ prolapse (POP) is a disorder in which one or more of the pelvic organs descends from the normal position. Vaginal laxity is differentiated from POP in that prolapse involves the descent of one or more organs whereas laxity focuses on looseness of the vagina, commonly at the introitus.

POP may be treated conservatively with a pessary or surgery. Vaginal laxity can be treated surgically or with energy-based (radiofrequency or laser) devices which are designed to promote tissue remodeling in an office-based setting,[6,7] although the existing data is mostly observational.[1] POP is typically treated by a Female Pelvic Medicine and Reconstructive Surgeon, gynecologist or urologist, while vaginal laxity is treated by a variety of practitioners from different specialties, including dermatology, plastic surgery, urology and gynecology. While patients who seek treatment for one condition or the other may benefit from thorough evaluation of both, there is limited data on the incidence of concurrent POP and symptoms of vaginal laxity as studies of vaginal laxity often exclude patients with clinically significant POP.[6] Laxity studies are limited to asymptomatic patients with Stage 0 or 1 prolapse. These patients have been shown to have low prolapse-specific distress as measured by the Pelvic Floor Distress Inventory (PFDI-20) subsection POP Distress Inventory (POPDI-6) score with a mean of 6 (95% CI 3,8).[8]

Sexual function, which can be assessed with the Female Sexual Function Index (FSFI), may be affected by both vaginal laxity and POP. While studies have shown that patients who underwent vaginoplasty repairs for introital laxity demonstrated improved sexual function, these studies were limited in that they were retrospective and did not use a validated measure to assess sexual function.[9,10,11] One study found that vaginal dimensions, both total vaginal length (TVL) and genital hiatus (GH), did not impact sexual activity or function.[12] However, these measures do not necessarily assess laxity which, as a sensation of looseness, is typically individualistic and may be associated with physical changes to the vaginal tissue integrity.[6] Thus, further exploration into laxity and its association with sexual function is necessary.

The aim of this study was to determine whether vaginal laxity symptoms are correlated with the physical exam finding of POP. We hypothesized that vaginal laxity would be well correlated with POP. Additionally, we aimed to determine if vaginal laxity symptoms were correlated with POP symptoms, Kegel pelvic floor muscle strength, sexual function and partner perception.

METHODS

This was a multi-center cross-sectional study conducted at MedStar Washington Hospital Center (Washington, DC) and Maimonides Medical Center affiliated with Northwell Health (New York, New York). This study was approved by the Institutional Review Boards of MedStar Health Research Institute and Maimonides Medical Center. Eligible subjects were women 18 years of age or older, presenting to a urogynecology, or female urology clinic who were sexually active with a parity of 1 and last delivery greater than 3 months prior to enrollment. Informed consent was obtained from all participants. Of note, these women were not presenting with a specific complaint of laxity. This was done intentionally to allow for a range of vaginal laxity symptoms. Sexual activity was defined by the FSFI as activity within the past 4 weeks that may include caressing, foreplay, masturbation, and vaginal intercourse. Patients who were pregnant at the time of evaluation, had surgery for POP within 6 weeks prior to evaluation, or were unable to tolerate a pelvic exam were excluded from the study.

Potential subjects were approached by their treating physician in the context of a private clinical visit regarding enrollment in the study. Women who met the inclusion criteria and agreed to participate were asked to complete the Vaginal Laxity Questionnaire (VLQ), the Pelvic Floor Distress Inventory-20 (PFDI-20), and the Female Sexual Function Index (FSFI). The FSFI was chosen over the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12) due to the fact that patients without prolapse (45/95) were included in the study. A FSFI score <26 is considered to be associated with female sexual dysfunction. Demographic data including age, comorbidities and menopausal status were extracted from the medical record. The current standard assessment of vaginal laxity is the use of self-reported tools.[6] The Vaginal Laxity Questionnaire (VLQ), the only available tool for VL assessment,[6] asks patients to score vaginal laxity on a scale of 1 to 7, with 1 being very loose and 7 being very tight[6] (Appendix A). The VLQ scale is commonly used in studies of treatment of vaginal laxity with energy-based modalities[6]. It was originally designed by Millheiser et al to assess self-reported perception of vaginal laxity in their study of radiofrequency treatment for vaginal introital laxity.[13] Since then, it has been used as an outcome measure in a number of studies of radiofrequency treatment of vaginal laxity. The VLQ is not a validated study tool, but to date no validated patient-reported tool exists for VL. Patients were also asked if a partner had commented on vaginal tightness. There is no standardized questionnaire of partner-reported vaginal laxity and so for this study we asked patients "Has a partner ever commented on your vagina being tight or loose?" with answer options being "Never commented," "Tight" or "Loose."

Subjects underwent a detailed pelvic exam by a urogynecologist, which included the POP-Q exam, evaluation of mid-vaginal caliber and pelvic floor muscle strength via the Brink scale. The POP-Q exam is a standardized measurement of POP which

includes measurements of the genital hiatus (GH), perineal body (PB), point Ba (the lowest point of the anterior vaginal wall), point Bp (the lowest point of the posterior vaginal wall) and C (cervix or cuff descent) during Valsalva.[14] Mid-vaginal caliber was measured as the diameter of the vagina at midpoint, defined as half of the total vaginal length (TVL) measurement based on POP-Q.

The primary outcome was correlation between vaginal laxity symptoms as measured by the VLQ and POP on physical exam using the POP-Q, specifically GH, TVL and PB. Sample size was calculated to perform a 2-tailed correlation with a beta of 0.2 and a correlation coefficient of 0.3, which is considered a low positive correlation. The minimum sample size was calculated to be 85. Accounting for a 10% attrition rate, the goal for recruitment was 95 total patients. Sample size calculation of a one sample correlation test using the Fisher transformation was conducted using PASS 12 (NCSS, LLC).

Correlation between laxity symptoms and prolapse measurements were assessed using Spearman's correlation due to the skewed nature of the VLQ. Continuous variables were aggregated as means and standard deviations and categorical variables were summarized as frequencies and percentages. The Spearman correlation analysis was performed to detect association between continuous variables, and the differences of continuous variables between groups were assessed by T Test or Wilcoxon rank sum test depending on the distribution of data.

Table 1. Patient characteristics

Characteristic	Participants
Age, mean (±SD), (min, max)	54.33 (±13.18), (27.00, 76.00)
BMI, mean (±SD), (min, max)	26.62 (±5.61), (15.69, 46.34)
Parity†, mean (±SD) (min, max)	2.16 (±1.01), (0, 6)
FSFI total score, mean (±SD), (min, max)	23.42 (±7.70), (3.60, 36.00)
PFDI-20 total score, mean (±SD), (min, max)	66.57 (±51.77), (0,175)
VLQ score, mean (±SD), (min, max)	4.18 (±1.33), (1.00, 7.00)
GH*, mean (±SD), (min, max)	2.95 (±1.25), (1.00, 9.00)
Menopause	
Yes (%)	59 (63.44%)
No (%)	34 (36.56%)
Estrogen therapy	
Yes (%)	23 (38.98%)
No (%)	36 (61.02%)
Partner comment on vaginal laxity	
Never commented (%)	67 (72.04%)
Tight (%)	19 (20.43%)
Loose (%)	7 (7.53%)

BMI = body mass index; FSFI = Female Sexual Function Index; PFDI = Pelvic Floor Distress Inventory; VLQ = Vaginal Laxity Questionnair.
*GH measured in centimeters as part of the POP-Q assessment.
†Two participants were excluded with a parity of 0.

RESULTS

A total of 95 subjects were included in the study. The average age among subjects was 54.3 ± 13.18 years with an average parity of 2.12 ± 1.06. Sixty-three percent of patients were postmenopausal and 61% of these were not on local vaginal estrogen therapy. The average age of postmenopausal patients was 61.98 years, while that of pre-menopausal patients was 41.43 years. The average VLQ score was 4.2 ± 1.35 and the average FSFI score was 23.42 ±7.67, out of a total of 36 (Table 1).

There was no significant correlation between VLQ scores and prolapse stage or POP-Q measurements such as GH, PB, TVL, point Ba, point Bp, and C. There was also no correlation between VLQ and Brink pelvic floor muscle score or mid-vaginal caliber (Table 2). Subgroup analyses of subjects who were premenopausal, postmenopausal on vaginal estrogen and postmenopausal not on vaginal estrogen showed a trend toward correlation of VLQ score and GH measurement in premenopausal women (P = .08) (Table 3).

There was no significant correlation between VLQ scores and prolapse symptoms as measured by the PFDI (Table 2). There was no significant correlation between VLQ score and overall prolapse stage (Table 4). While VLQ score was not correlated with overall prolapse stage, it trended towards a significant correlation in the subgroup of premenopausal women with VLQ scores of 3.5 and 4.33 in premenopausal women with prolapse stages 2−4 and 0−1, respectively (P = .09) (Table 4). In addition, VLQ score was significantly correlated with the C and Ba point in premenopausal women (Table 3).

Sexual function as measured by the FSFI was not associated with VLQ (Table 5). Sexual function (FSFI), however, was negatively correlated with prolapse symptoms (PFDI) (P = .01) (Table 5). VLQ was not correlated with overall parity however trended towards a significant correlation with number of vaginal deliveries (Table 2). In the overall study population, a sensation of vaginal tightness was significantly associated with increasing age (P = .01) (Table 2). Among post-menopausal women, there was no significant difference in either VLQ or FSFI for those using any type of estrogen (systemic or local) (Table 6). Most partners did not comment on laxity (72%) and the majority commented on the vagina being tight (21%) rather than loose (7%) (Table 1). Patient sensation of vaginal tightness as measured by VLQ was correlated with partner commenting on vaginal tightness (P = <.0001) (Table 7).

DISCUSSION

The advent of energy-based treatments and the new IUGA/ICS terminology has brought more attention to the symptom of vaginal laxity. Studies of vaginal laxity and its treatment with

Table 2. Correlation between VLQ and GH, PB, TVL, POPDI-6 score, Brink total score, and caliber

		Spearman correlation statistics (Fisher's z transformation)				
Factor	N*	Sample correlation	Fisher's z	95% Confidence limits		*P*-value
GH†	90	−0.15	−0.15	−0.35	0.06	.16
PB†	90	0.07	0.07	−0.14	0.27	.52
TVL¶	91	0.06	0.06	−0.15	0.26	.59
Ba†	93	−0.13	−0.14	−0.33	0.07	.20
Bp†	93	−0.11	−0.11	−0.31	0.09	.28
C†	89	−0.21	−0.21	−0.40	0.0001	.05
POPDI-6 score	93	−0.07	−0.07	−0.27	0.13	.49
Brink score	89	0.07	0.07	−0.14	0.27	.54
Caliber‡	89	0.01	0.01	−0.20	0.21	.96
Age	92	0.26	0.26	0.05	0.44	.01
Parity	93	0.02	0.02	−0.18	0.22	.84
Vaginal delivery	92	−0.16	−0.16	−0.35	0.05	.14

GH = genital hiatus; PB = perineal body; POPDI = pelvic organ prolapse distress inventory; TVL = total vaginal length.
*Data are missing for 4 participants for GH and PB, 3 participants for TVL, 5 participants for Brink score, 6 participants for caliber, 1 participant for age, 1 participant for vaginal deliveries.
†GH, PB, Ba, Bp, C measured in centimeters are part of the POP-Q assessment, all measured with Valsalva.
¶TVL measured at rest.
‡Caliber measured in centimeters at the vaginal midpoint.

Table 3. Correlation of VLQ scores and POP-Q measurements: Subgroup analyses

			Spearman correlation statistics (Fisher's z transformation)				
Variable	Factor	N	Sample correlation	Fisher's z	95% confidence limits		*P* Value
Premenopausal							
VLQ	PB	33	−0.05	−0.05	−0.39	0.30	0.77
	GH	33	−0.31	−0.32	−0.59	0.04	0.08
	TVL	33	0.17	0.17	−0.18	0.48	0.35
	Ba	33	−0.35	−0.36	−0.62	−0.003	0.05
	Bp	33	−0.21	−0.21	−0.51	0.15	0.25
	C	33	−0.40	−0.42	−0.65	−0.07	0.02
Postmenopausal, nonestrogen							
VLQ	PB	35	−0.0002	−0.0002	−0.33	0.33	1.0
	GH	35	−0.12	−0.12	−0.43	0.22	0.50
	TVL	36	−0.14	−0.14	−0.45	0.20	0.41
	Ba	37	−0.12	−0.12	−0.43	0.21	0.47
	Bp	37	0.008	0.008	−0.32	0.33	0.96
	C	35	−0.17	−0.17	−0.47	0.18	0.34
Postmenopausal, estrogen							
VLQ	PB	23	0.10	0.10	−0.32	0.49	0.64
	GH	23	0.03	0.03	−0.39	0.44	0.89
	TVL	23	0.20	0.21	−0.23	0.57	0.35
	Ba	23	0.13	0.13	−0.30	0.52	0.55
	Bp	23	−0.05	−0.05	−0.45	0.37	0.83
	C	21	−0.13	−0.13	−0.53	0.32	0.59

GH = genital hiatus; PB = perineal body; TVL = total vaginal length; VLQ = vaginal laxity questionnaire.

energy-based technologies typically use the VLQ to assess baseline symptoms and improvement with treatment. These studies also typically exclude patients with clinically significant prolapse. Our study found that vaginal laxity symptoms as measured by the VLQ were not correlated with physical exam findings or symptoms of prolapse. Vaginal laxity symptoms were not correlated with sexual function but prolapse symptoms were correlated with sexual function, as shown in prior studies.[15,16] More postmenopausal subjects commented on tightness, but estrogen therapy did not appear to change this sensation. Of note, the average FSFI in this population met the criteria for female sexual dysfunction (<26).

Table 4. Correlation of VLQ score and prolapse stage

	Prolapse stage		
	0-1	2-4	*P* value
Overall			
	n = 42	n = 51	
VLQ	4.33 (1.34)	4.1 (1.33)	.33
Premenopausal women			
	n = 15	n = 20	
VLQ	4.33 (1.35)	3.50 (1.40)	.09
Postmenopausal women, nonestrogen			
	n = 17	n = 20	
VLQ	4.53	4.55	.96
Postmenopausal women, estrogen			
	n = 13	n = 10	
VLQ	4.15 (1.34)	4.40 (1.08)	.64

VLQ = vaginal laxity questionnaire.

Table 6. Comparison of VLQ and FSFI with estrogen therapy (systemic or local)

	Yes n = 23	No n = 37	*P* value
VLQ (SD)	4.26 (1.21)	4.54 (1.30)	.41
FSFI (SD)	24.28 (6.78)	22.30 (8.95)	.37

FSFI = female sexual function index; VLQ = vaginal laxity questionnaire.

Table 7. Correlation of VLQ and partner reported looseness

	Tight n = 19	Loose n = 7	*P*-value
VLQ (SD)	5.63 (1.01)	2.00 (1.00)	<.0001

VLQ = vaginal laxity questionnaire.

As vaginal laxity gains more attention, there is a need for further understanding of this symptom. In the current study, symptoms of laxity, as measured by the VLQ, were not associated with bothersome symptoms from POP on the PFDI or objective prolapse as measured by the POP-Q on physical exam. This is in contrast to the study by Dietz et al which evaluated vaginal laxity as a binary variable and found that laxity was associated with POP symptoms, bother or subjective complaint, as well as objective physical exam with an odds-ratio of 2.62 (1.31−5.24)[17] and with the strongest associations found with the physical exam measurements of the GH and PB. The study by Dietz et al found no meaningful associations between any of the above measures and the bother of vaginal laxity as measured on a visual analog scale from 1 to 10.[17] In the current study, laxity was not correlated with pelvic floor muscle strength or caliber. This suggests that the VLQ is either measuring another symptom or finding distinct from those evaluated in this study; or that the VLQ may be not be applicable to this population.

In support of prior studies, the current study found that prolapse symptoms are correlated with sexual dysfunction.[15-16] The relationship between laxity and sexual function is less well understood. The limited retrospective data that exists suggests that surgical repair of vaginal laxity may improve sexual function.[9-11] The results of this study suggest that laxity symptoms are not associated with sexual function as measured by the FSFI. Although this is not consistent with prior data, it is possible that baseline laxity is not associated with sexual function, but repair of laxity might improve sexual function. It is also possible that bother from laxity is not well-assessed with the FSFI which focuses on the domains of desire, arousal, lubrication, orgasm, satisfaction and pain. The PISQ-12 is a sexual function scale used to measure sexual function in patients with prolapse and incontinence; it was not used in this study because patients were included who did not have those complaints. It is possible that the PISQ-12 may be a better measure of sexual function in patients who complain of laxity as well and further study is needed.

With regard to risk factors for vaginal laxity, VLQ did trend towards a significant correlation with vaginal parity, which was also seen in the study by Dietz et al suggesting that vaginal birth trauma may in some way contribute to laxity. In contrast, vaginal tightness was positively correlated with age and menopausal status, regardless of local hormone therapy use. A similar finding was noted by Dietz et al who found that laxity was associated with younger age.[17] A possible interpretation is that vaginal tightness may be due to the common post-menopausal symptom of vulvovaginal atrophy or genitourinary syndrome of menopause (GSM). It has been shown that GSM is associated with aspects of sexual dysfunction and can be improved with systemic or local vaginal estrogen therapy.[18] However, given that age and menopausal status were correlated with tightness, regardless of

Table 5. Correlation between FSFI and VLQ, PFDI total score, and POPDI-6

		Spearman correlation statistics (Fisher's z transformation)				
Factor	N*	Sample correlation	Fisher's z	95% Confidence limits		*P*-value
VLQ	90	0.14	0.14	−0.07	0.34	.18
PFDI total score	90	−0.25	−0.25	−0.43	−0.04	.02
POPDI-6	90	−0.10	−0.10	−0.30	0.11	.37

PFDI = pelvic floor distress inventory; POPDI = pelvic organ prolapse distress inventory; VLQ = vaginal laxity questionnaire.
*Data is missing for 3 participants for FSFI.

local estrogen use, this correlation may be due to something other than GSM alone, or may not be fully reversable with local estrogen therapy.

In the study population of mostly post-menopausal patients presenting to urogynecology and female urology clinics, the average FSFI was 23.42 (range 3.60-36.00) falling below the cut-off of 26 which meets criteria for female sexual dysfunction (Table 1). This highlights the importance of assessing for sexual dysfunction in all patients with pelvic floor complaints. The average VLQ score in this population was close to neutral (4 on the 7-point scale), meaning they did not have symptoms of vaginal looseness or tightness.

Partners rarely commented on vaginal laxity, and more often commented on tightness rather than laxity, despite women reporting some spectrum of vaginal laxity. Partner comment in this study was not used as an objective measure of laxity but rather a potential independent variable which might affect patient perception of laxity. Asking partners directly about perceptions of laxity may have provided different information as only 28% of patients reported partners had commented. Asking patients for information on partner comment rather than asking partners directly resulted in imperfect data on true partner perception but did provide data on patient views of partner perception.

The strengths of this study lie in the multi-center design which allowed for enrollment of a diverse patient population with a range of laxity and prolapse symptoms. Furthermore, by evaluating vaginal laxity with the VLQ which is used in studies of energy-based treatments for laxity and typically exclude patients with prolapse, this study contributed to the literature by providing information on the relationship between VLQ and both symptoms and physical exam findings of prolapse. Additionally, prior studies which assessed the relationship between laxity and prolapse did not assess sexual function which is often the reason for seeking treatment for laxity. This study provided information on sexual function as it relates to laxity in patients with a range of prolapse symptoms and is unique in that it evaluated partner assessment of vaginal laxity by patient report.

In this study, patients did not have to complain of laxity or prolapse to be enrolled. While this was done to allow for a range of laxity symptoms, the average VLQ score was much higher than in the studies of patients seeking energy-based treatments for laxity and thus limits the generalizability of these results to that patient population. In a study of patients with complaints of vaginal laxity without clinically significant prolapse, baseline VLQ was 2.4±0.9, much lower than the average (4.2 ± 1.35) seen in this study.[6] While it is important to recognize the limitation of generalizability to patients with laxity complaints, this study adds to existing literature by providing information on VLQ scores among patients who do not have laxity complaints. It is important to recognize that laxity may be under-reported as patients often under-report sexual complaints. The greatest limitation of this study was lack of reporting on physical exam findings of vaginal atrophy which may contribute to symptoms of tightness. Future research is necessary to evaluate the relationship between laxity and tissue properties such as signs of vaginal atrophy. There is also a need for further understanding of partner reported laxity by query of partners and how this affects patient perception.

CONCLUSIONS

There has been limited research on vaginal laxity symptoms in the context of POP. Vaginal laxity as measured by the VLQ was not correlated with symptoms or physical exam findings of POP, nor was it correlated with sexual function as measured by the FSFI. Sexual dysfunction was common in this population despite normal VLQ scores, suggesting that sexual function is complex and VLQ is either measuring a symptom or finding distinct from those evaluated in this study or that the VLQ may be an imperfect measurement scale. More research should be done to better define the symptoms of vaginal laxity and assess if there are any objective measures which are correlated with this subjective complaint.

ACKNOWLEDGMENTS

We thank Stephen Fernandez, MPH for help with early statistical support. We also thank study participants for their time and involvement in this study.

Corresponding Author; E-mail: viduong414@gmail.com

Conflict of Interest: The authors report no conflict of interest.

Funding: None.

STATEMENT OF AUTHORSHIP

Conceptualization, CI, AP, SB; Methodology, CI, AP, HW; Investigation, JF, AP, VD, AI, RF; Formal analysis HW, Writing – Original Draft, JF, RF, AI, VD; Writing – Review & Editing, VD, JF, CI, AP; Funding Acquisition, AP, AI; Supervision, CI, SB, AP.

REFERENCES

1. Shoeiri SA, Kerkhof MH, Minassian VA, et al. IUGA committee opinion: Laser-based vaginal devices for treatment of stress urianry incontinence, genitourinary syndrome of menopause, and vaginal laxity. **Int Urogynecol J 2019;30:371–376.**
2. Rogers RG, Pauls RN, Thakar R, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) Joint report on the terminology for the assessment of sexual health of women with pelvic floor dysfunction. **Int Urogynecol J 2018;29:647–666.**
3. Pauls RN, Fellner AN, Davila GW. Vaginal laxity: A poorly understood quality of life problem; A survey of physician members of the International Urogynecological Association (IUGA). **Int Urogynecol J 2012;23:1435–1448.**

4. Pauls RN, Occhino JA, Dryfhout VL. Effects of pregnancy on female sexual function and body image: A prospective study. **J Sex Med 2008;5:1915–1922.**
5. Griffiths A, Watermeyer S, Sidhu K, et al. Female genital tract morbidity and sexual function following vaginal delivery or lower segment caesarean section. **J Obstet Gynaecol 2006;26:645–649.**
6. Krychman M, Rowan CG, Allan BB, et al. Effect of single-treatment, surface-cooled radiofrequency therapy on vaginal laxity and female sexual function: The VIVEVE I randomized controlled trial. **J Sex Med 2017;14:215–225.**
7. Lee MS. Treatment of vaginal relaxation syndrome with an erbium: YAG laser using 90° and 360° scanning scopes: a pilot study & short-term results. **Laser Ther 2014;23:129–138.**
8. Lowder JL, Ghetti C, Oliphant SS, et al. Normative data for commonly used validated pelvic floor disorder questionnaires in women. **Female Pelvic Med Reconstr Surg 2010;16:296–298.**
9. Goodman MP, Placik OJ, Benson 3rd RH, et al. A large multicenter outcome study of female genital plastic surgery. **J Sex Med 2010;7:1565–1577.**
10. Pardo JS, Solà VD, Ricci PA, et al. Colpoperineoplasty in women with a sensation of a wide vagina. **Acta Obstet Gynecol Scand 2006;85:1125–1127.**
11. Goodman MP. Female genital cosmetic and plastic surgery: A review. **J Sex Med 2011;8:1813–1825.**
12. Schimpf MO, Harvie HS, Omotosho TB. Does vaginal size impact sexual activity and function? **Int Urogynecol J 2010;21:447–452.**
13. Millheiser LS, Pauls RN, Herbst SJ, et al. Radiofrequency treatment of vaginal laxity after vaginal delivery: Nonsurgical vaginal tightening. **J Sex Med 2010;7:3088–3095.**
14. Bump RC, Mattiasson A, Bø K, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. **Am J Obstet Gynecol 1996;175:10–17.**
15. Tok EC, Yasa O, Ertunc D, et al. The effect of pelvic organ prolapse on sexual function in a general cohort of women. **J Sex Med 2010;7:3957–3962.**
16. Zielinski R, Miller J, Low LK, et al. The relationship between pelvic organ prolapse, genital body image and sexual health. **Neurourol Urodyn 2012;31:1145–1148.**
17. Dietz HP, Stankiewicz M, Atan IK, et al. Vaginal laxity: What does this symptom mean? **Int Urogynecol J 2018;29:723–728.**
18. Fernandes T, Costa-Paiva LH, Pinto-Neto AM. Efficacy of vaginally applied estrogen, testosterone, or polyacrylic acid on sexual function in postmenopausal women: A randomized control trial. **J Sex Med 2014;11:1262–1270.**

APPENDIX A SAMPLE VLQ QUESTIONNAIRE[6]

Vaginal laxity questionnaire
Please select one choice regarding your vagina with respect to sexual activity
1 Very loose
2 Moderately loose
3 Slightly loose
4 Neither tight nor loose
5 Slightly tight
6 Moderately tight
7 Very tight