THE JOURNAL OF
SEXUAL MEDICINE

PAIN

Motor Function and Perception of Health in Women with Provoked Vestibulodynia

Ingrid Næss, MSc,[1,2] Helena C. Frawley, PhD, FACP,[3] and Kari Bø, PhD[2,4]

ABSTRACT

Background: Provoked vestibulodynia (PVD) is a prevalent and disabling condition in women that may be associated with reduced quality of life and impairment of physical functioning.

Aim: To investigate whether women with PVD have different motor functions, posture and breathing patterns, and whether they perceive their physical health differently, compared with asymptomatic controls.

Methods and Main Outcome Measure: The Standardized Mensendieck Test (SMT) and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) were used to assess differences between 35 women with PVD and 35 healthy controls.

Results: There were no statistically significant differences in any of the 5 motor domains of the SMT between the women with PVD and those without PVD: standing posture, 4.0 (0.6) vs 5.0 (0.6); gait, 4.7 (0.6) vs 4.8 (0.6); movement, 4.8 (0.8) vs 5.1 (0.6); sitting posture, 4.7 (1.0) vs 4.9 (0.8); respiration, 4.7 (1.0) vs 4.7 (0.9). Women with PVD scored significantly lower in all domains on the SF-36 (adjusted Bonferroni $P = .002$) except physical functioning.

Clinical Implications: Given the lack of difference in the SF-36 physical functioning domain and in all 5 domains of the SMT between women with PVD and those without PVD, the value of interventions focusing on general physical function is unclear.

Strengths & Limitations: A study strength is the use of an assessor-blinded case-control design, trained physiotherapists to conduct the tests, and valid and reliable outcome measures. A limitation is the homogeneity of the sample of young nulliparous women, which limits the generalizability of our findings to other study populations.

Conclusion: Young nulliparous women with PVD did not score differently from a group of healthy controls on assessment of overall physical functioning or on standing posture, gait, movement, sitting posture, and respiration. However, the score for perception of general health was lower in the women with PVD compared with controls. **I. Næss, H.C. Frawley, K. Bø. Motor Function and Perception of Health in Women with Provoked Vestibulodynia. J Sex Med 2019;16:1060–1067.**

Key Words: Standardized Mensendieck Test; 36-Item Short-Form Health Survey; Provoked Vestibulodynia; Breathing; Motor Control; Movement; Physiotherapy; Posture

INTRODUCTION

Vulvodynia is defined as "vulvar pain of at least 3 months' duration, without clear identifiable cause, which may have potential associated factors."[1] Its etiology is postulated to be multifactorial, with inflammatory, hormonal, congenital, genetic, neuroproliferative, and muscular factors contributing.[2] The muscular factors are considered specifically related to the pelvic floor muscles (PFMs).[2,3] Vulvodynia may be described as localized or/and generalized, provoked or spontaneous, and primary or secondary, and may present with a varying temporal pattern (intermittent, persistent, constant, immediate, or delayed).[1]

Received January 11, 2019. Accepted April 22, 2019.

[1]Institute of Health and Society, University of Oslo, Oslo, Norway;

[2]Department of Obstetrics and Gynecology, Akershus University Hospital, Lørenskog, Norway;

[3]Department of Physiotherapy, Monash University, Melbourne, Australia;

[4]Department of Sports Medicine, Norwegian School of Sports Medicine, Oslo, Norway

https://doi.org/10.1016/j.jsxm.2019.04.016

Provoked vestibulodynia (PVD) has been recognized as the leading cause of premenopausal chronic vulvar pain.[4] A Swedish population study found a 13% prevalence of vulvodynia in women age 20−29 years.[5] The impact of PVD is significant;[6] it causes pain with penetration in the majority of women and may contribute to a fear of pain[7] and thus severely affect sexual relationships and quality of life.[6]

Physiotherapy, including PFM therapy, is recommended by most guidelines for treating vulvodynia.[8,9] These recommendations are informed mostly by observational studies, however. A more recent systematic review found that physical therapy modalities—mostly combinations of various behavioral, exercise, and manual therapies directed to the PFMs—were effective in decreasing pain during intercourse and improving sexual function.[10] To date, the focus of therapy has been on PFM relaxation, owing to an observed association with increased PFM tone and PVD in some studies[11−14]; however, not all studies have observed this association.[15] Some studies have used both active PFM contraction and active PFM relaxation to achieve a reduction in tone.[16−18]

Despite the rationale for therapy to target the PFMs, several studies have included interventions to improve global muscle relaxation and breathing techniques together.[19,20] The possible rationale for a more general approach to therapy could be that for most sufferers, PVD is a chronic pain condition, and both central and peripheral factors should be considered. Guidelines recommend that clinical care for vulvodynia should follow the principles of general chronic pain management, and that treatment should be holistic and focus not only on the primary site of pain, but also on its subsequent impact on patients' lifestyle and sexual functioning.[8] However, studies that have provided multimodal therapies did not assess general muscle relaxation, posture, and respiration in participants before treatment and after treatment, and thus no conclusions regarding the effectiveness of these interventions in women with PVD can be drawn.

In a case-control study, Haugstad et al[21] found that women with chronic pelvic pain had a specific pattern of posture, movement, muscle pathology, and reduced body awareness compared with healthy controls as assessed using the Standardized Mensendieck Test (SMT). The SMT is based on observation and analysis of respiration, posture, and motor function and was developed to evaluate patients with psychosomatic disorders. It has been deemed reliable and valid for assessing patients with chronic pelvic pain.[22] Subsequent to their case-control study, Haugstad et al[23] conducted a randomized controlled trial in women with nonspecific chronic pelvic pain, applying a combination of Mensendieck exercises and cognitive therapy known as Mensendieck somatocognitive therapy. Participants with chronic pelvic pain showed significantly improved scores in all motor function and respiration patterns and reduced pain by 50% compared with the control group.[23] Further improvement was seen at 9 months after cessation of treatment.[24] Because PVD is a pelvic pain condition, patients with PVD may exhibit the same changes in posture, movement patterns, and respiration. Haugstad et al[25] recently tested this assumption and found that young women with PVD had better scores in all domains of the SMT than women with chronic pelvic pain but worse scores than historical controls. However, the 2 groups of participants were drawn from different populations and were not assessed contemporaneously, and thus the assessors were not blinded to the participants' background.

Currently, there is scant knowledge regarding the difference between women with and without PVD in impairments of posture, global muscle function, and breathing patterns and in self-reports of general health. Therefore, the purpose of the present study was to evaluate whether women with PVD have differences in posture, movement, and breathing patterns compared with asymptomatic controls and also whether they perceive their general health differently than controls.

METHODS

This is an exploratory secondary analysis of an assessor-blinded comparison study. The primary aim of the initial study was to compare PFM variables, as measured by manometry (vaginal resting pressure, PFM strength, and PFM endurance) and surface electromyography between women with PVD and controls and reported elsewhere.[15] The secondary aim was to investigate whether the 2 groups differed in terms of global physical function and perception of health, as assessed using the SMT and SF-36.

This study was approved by the regional Committee for Medical and Health Ethics South-East (2010/3257-1). All subjects provided written informed consent before entering the study.

Participants

Gynecologists at the Oslo University Hospital and in private practice in the Oslo region recruited women aged 16−38 years diagnosed with PVD for the study. Control participants were recruited through friends of the women with PVD and via the Internet, public advertisements, and work colleagues. The participants were diagnosed by gynecologists according to current vulvodynia guidelines, and a blinded cotton swab test confirmed the diagnosis.[15] Inclusion criteria for the study were nulliparity and ability to understand Scandinavian languages. Exclusion criteria were presence of *Candida* and inability to contract the PFM correctly. The latter was assessed by observation of inward movement of the perineum by an experienced women's health physiotherapist.

Power Calculation

Because this study was a secondary analysis, a power calculation was not performed. A power calculation was done for the primary outcome of the primary study.[15] When planning the

primary study, no vaginal pressure data were available for patients with PVD; therefore, we used a difference in PFM strength between women with and without urinary incontinence of 6.6 cmH_2O (95% CI, 2.3−10.8 cmH_2O), as reported by Hilde et al.[26] With a 2-tailed test, significance level of $P < .05$, and power of 80%, at least 35 participants were required in each group of the primary study. Data from those same 70 participants are reported in this study.

A comprehensive questionnaire used at the Vulvaclinic in Oslo University Hospital was modified for use in this study. Sociodemographic data and medical history information were collected, including onset and duration of symptoms, frequency of yeast infections, urinary and bowel symptoms, contraceptive use, and physical activity habits.

Outcomes

Primary Outcome: SMT

The SMT evaluates 5 motor domains: standing posture, gait, movement, sitting posture, and respiration. It consists of 23 test items, each given a score on a scale of 0−7, with 7 representing optimal function. The score of each subtest and motor domain can be evaluated independently.[22] The full test protocol takes 5−7 minutes to complete. The SMT has been found to have intraclass correlation coefficient scores ranging from 0.82 to 0.97 in the hands of experienced Mensendieck physiotherapists and to discriminate well between women with chronic pelvic pain, as classified by the International Statistical Classification of Diseases and Related Health Problems, Tenth Edition, and matched healthy controls (sensitivity, 0.9; specificity, 0.7).[22]

Secondary Outcome: SF-36

The Medical Outcomes Study 36-item SF-36,[27] with the 8-item reliable and validated version translated into Norwegian,[28] was used to report perceived general health. Each item represents 1 dimension of the SF-36. Items include general health (GH), covering personal evaluation of health, including current health, health outlook, and resistance to illness; physical functioning (PF), the extent to which health limits physical activities, such as self-care, walking, climbing stairs, bending, lifting, and moderate and vigorous exercise; role/physical (RP; role of physical health problems in work or other daily activities), the extent to which physical health interferes with work or other daily activities, including accomplishing less than wanted, limitations in types of activities, or difficulty performing activities; bodily pain (BP), which refers to the intensity of pain and effect of pain on normal work, both inside and outside the home; vitality (VT), which refers to feeling energetic and full of pep vs feeling tired and worn out; social functioning (SF), the extent to which physical health or emotional problems interfere with normal social activities; mental health (MH), general mental health, including depression, anxiety, behavioral-emotional control, general positive affect; and role/functioning emotional (RE), the extent to which emotional problems interfere with work or other daily activities, including decreased time spent on activities, accomplishing less, and not working as carefully as usual.[29]

In the RAND scoring system, scores in each domain range from 0 to 100, with higher scores indicating better functioning. Scores above 50 and below 50 are considered above and below the average in the general US population, respectively.[20] The SF-36 is recommended for use in vulvodynia clinical trials as a self-report outcome measure.[30]

Procedure

The participants were informed by a single physiotherapist (I.N.) about the questionnaires and the purpose of blinding of another Mensendieck physiotherapist performing the SMT. The patients were asked not to converse except when asked to, because the examiner was following a strict protocol.[22] All tests were conducted in the same room by 2 experienced Mensendieck physiotherapists blinded to patient group affiliation.

Statistical Analyses

Background variables are presented as mean with standard deviation (SD) or number with percentage. The Student t test was used to analyze differences between groups. Significance level was set to $\leq .05$. Bonferroni correction for multiple comparisons gave P values of $\leq .01$ for the SF-36, $\leq .002$ for all 23 subscores on the SMT, and $\leq .01$ for the 5 average scores of each domain of the SMT.

RESULTS

Table 1 presents the background characteristics of the study group. The mean (SD) age of the participants was 24.3 (4.7) years, and mean BMI was 22.0 (2.6) kg/m^2. Most of the women in both groups reported being physically active at least once a week, and approximately 20% of both samples were performing PFM exercises. There were no significant differences between women with and without PVD in any background variables.

Using Bonferroni correction to correct for the effect of multiple testing, Table 2 shows no statistically significant differences between the 2 groups in any domains of the SMT. These results indicate that women with PVD had lower scores on knee stability ($P = .04$) and a tendency toward reduced ability to move their arms in a free pattern compared with controls ($P = .05$).

Table 3 presents data from the SF-36 in women with PVD and women without PVD. The women with PVD had statistically significantly lower scores in all domains except Physical Functioning. Bonferroni correction revealed significant

Table 1. Background characteristics for the entire cohort, women with PVD, and controls

Characteristic	All (N = 70)	PVD (N = 35)	Controls (N = 35)	*P* value between groups	*T* value diff (68)
Age, yr, mean (SD)	24.3 (4.7)	24.5 (4.7)	24.1 (4.7)	.71	0.38
BMI, mean (SD)	22.0 (2.6)	21.84 (2.9)	22.2 (2.3)	.56	
Relationship status, n				.46	0.75
Single		8	12		
Living with partner		22	12		
Boyfriend		5	10		
Education tertiary level, n				.11	1.60
Student/>4 yr		30	33		
<4 yr		5	2		
Work status, n				.12	1.57
Full-time student		4	10		
Work part time		20	16		
Work full time		11	8		
General exercise level, n				.17	1.41
No exercise		5	2		
Once a week		9	7		
2–3 times weekly		13	15		
>3 times weekly		8	11		
Use of contraception, n				.12	1.60
None	14	7	7		
Condom	11	9	2		
Oral	33	13	20		
Long-acting reversible contraception	11	6	5		
Performing PFM exercise, n				1.0	0.00
Yes		7	7		
No		28	28		
Urinary incontinence, n				.73	0.35
Yes		5	4		
No		30	31		
Flatus/(anal) incontinence, n				.14	1.50
Yes		6	2		
No		29	33		
Candida infection in last 3 yr, n				.06	1.89
Yes		27	19		
No		8	15		
Urinary infection in last 3 yr, n				.34	0.96
Yes		22	18		
No		13	17		

BMI = body mass index; PFM = pelvic floor muscle; PVD = provoked vestibulodynia.

differences in 6 out of 8 domains, with nonsignificant differences in the Physical Functioning and Role Emotional domains.

DISCUSSION

In the present study, young nulliparous women with PVD were not different from controls in any motor function variables, including posture and respiration, as assessed by the SMT. However, women with PVD scored significantly lower on all domains of the SF-36 except Physical Functioning, including Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional, and Mental Health ($P = .08$).

The finding of no difference in Physical Functioning between the groups as assessed by the SF-36 corresponds with the results of the SMT. In this study, women with diagnosed PVD had lower perceived health-related quality of life than controls in all SF-36 domains other than Physical Functioning and Role Emotional. Thus, we may conclude that the women with PVD perceived their physical function and emotional role as adequate. Our SF-36 findings are in line with other studies reporting

Table 2. SMT results for observed body awareness for the entire cohort, women with PVD, and controls

SMT domain	All (N = 70)	PVD (N = 35)	Controls (N = 35)	*P* value between groups	Bonferroni correction	*T* value diff (68)
Standing posture						
Global line of gravity	4.9 (0.7)	4.8 (0.7)	5.0 (0.7)	.25	NS	1.16
Ankle	5.3 (0.7)	5.2 (0.8)	5.3 (0.7)	.54	NS	0.62
Knee	5.1 (0.6)	4.9 (0.7)	5.3 (0.6)	.04	NS	2.08
Pelvis	5.1 (0.9)	5.1 (0.9)	5.1 (0.8)	1.00	NS	0.00
Back	4.7 (0.8)	4.7 (0.8)	4.8 (0.8)	.71	NS	0.37
Shoulder	4.9 (0.9)	4.9 (0.8)	4.9 (0.9)	.74	NS	0.34
Neck	4.8 (0.8)	4.8 (0.8)	4.9 (0.9)	.68	NS	0.42
Average	5.0 (0.6)	4.9 (0.6)	5.0 (0.6)	.46	NS	0.74
Gait						
Global	4.8 (0.6)	4.8 (0.6)	4.8 (0.7)	.95	NS	0.58
Foot roll	5.1 (0.6)	5.0 (0.7)	5.3 (0.5)	.11	NS	1.65
Propulsion	4.7 (0.7)	4.6 (0.7)	4.7 (0.8)	.47	NS	0.73
Rotation	4.5 (0.8)	4.5 (0.8)	4.5 (0.8)	.94	NS	0.07
Average	4.8 (0.6)	4.7 (0.6)	4.8 (0.6)	.52	NS	0.65
Movement (standing)						
Frontal arm lift	5.3 (0.9)	5.1 (0.9)	5.6 (0.9)	.07	NS	1.83
Vertical arm lift	5.1 (0.9)	4.9 (0.9)	5.2 (1.0)	.19	NS	1.33
Sagittal parallel arm swing	4.7 (0.9)	4.8 (1.0)	4.9 (0.8)	.05	NS	2.03
Sagittal diagonal arm swing	4.7 (1.0)	4.5 (1.2)	4.9 (0.8)	.05	NS	2.02
Hip flexion (1 foot standing)	5.1 (0.9)	5.0 (1.0)	5.2 (0.8)	.55	NS	0.60
Average	5.0 (0.7)	4.8 (0.8)	5.1 (0.6)	.05	NS	2.0
Sitting posture						
Global	4.7 (0.9)	4.7 (1.0)	4.9 (0.8)	.46	NS	0.74
Support	4.8 (1.1)	4.7 (1.1)	5.0 (1.1)	.24	NS	1.20
Pelvis	4.9 (1.0)	4.7 (1.1)	5.0 (0.8)	.13	NS	1.53
Back	4.7 (1.0)	4.6 (1.0)	4.7 (1.0)	.47	NS	0.72
Average	4.8 (0.9)	4.7 (1.0)	4.9 (0.8)	.22	NS	1.24
Respiration						
Global	4.7 (1.0)	4.6 (1.0)	4.7 (1.0)	.89	NS	0.57
Arm lift	4.7 (1.1)	4.8 (1.1)	4.6 (1.0)	.44	NS	0.78
Pelvis	4.7 (1.0)	4.7 (1.0)	4.7 (1.0)	.95	NS	0.06
Average	4.7 (1.0)	4.7 (1.0)	4.7 (0.9)	.89	NS	0.14

NS = not significant; SMT = Standardized Mensendieck Test.
Data are mean (SD). Bonferroni correction for multiple comparisons gave a *P* value of ≤.002 for all 23 subscores on the SMT and ≤.01 for the 5 average scores of each domain of the SMT.

reduced quality of life and high levels of psychological stress in women with PVD.[2,6,31,32] These domains apparently have no impact on these women's physical function, however. The interpretation of a minimal impact on physical function aligns with results of another study in which women with PVD displayed only mild levels of kinesophobia.[25] The SF-36 results indicate the perceived impact of PVD on these women's lives, suggesting that some women may need psychological support to help them with pain-coping strategies and to learn techniques to control the fear of pain.[33] Thus, a multidisciplinary approach with interventions tailored to this patient group is warranted.

Our results indicate that young nulliparous women diagnosed with PVD do not differ from healthy controls in terms of respiration, posture, and ability to discriminate and control different body parts. This finding contrasts with the recent results of Haugstad et al[25] who reported that women with PVD had reduced quality of movement, especially in gait and respiration patterns, which were 50% lower than optimal scores. However, in contrast to our study, which included a real-time matched control group, their comparison was based on data from 15 control women obtained 10 years earlier. Historical controls can differ in background variables of the study population, societal factors, and outcome measures, and thus such results must be interpreted with caution.

Based on their findings, Haugstad et al[25] suggested that physiotherapy for women with PVD should focus less on specific anatomic structures and more on "general body awareness, ability to relax, improved ability to cope with negative emotions and

Table 3. SF-36 scores in women with and without diagnosed PVD

SF-36 domain	All (N = 70)	PVD (N = 35)	Controls (N = 35)	*P* value between groups	Bonferroni correction	*T* value diff (68)
Physical Functioning (PF)	93.6 (12.0)	91.1 (15.0)	96.1 (7.2)	.08	NS	1.73
Role Physical (RP)	75.7 (35.6)	65.0 (39.9)	86.4 (24.5)	.01		2.71
Bodily Pain (BP)	65.1 (22.3)	53.6 (17.8)	76.5 (20.5)	<.01		4.83
General Health (GH)	72.1 (21.4)	64.2 (23.6)	80.1 (15.5)	<.01		2.12
Vitality (VT)	52.3 (21.4)	43.2 (23.2)	61.4 (14.9)	<.01		0.49
Social Functioning (SF)	81.8 (21.1)	75.0 (24.4)	88.6 (14.7)	<.01		0.31
Role Emotional (RE)	76.2 (36.8)	65.7 (42.4)	86.7 (27.1)	.02	NS	2.56
Mental Health (MH)	71.7 (17.4)	63.1 (19.9)	80.3 (8.2)	<.01		3.13

NS = not significant; PVD = provoked vestibulodynia.
Data are mean (SD). Bonferroni correction for multiple comparisons gave a *P* value of ≤.01.

thoughts, and structure exposure to pain-associated activities." Our results indicate that women with PVD do not have impaired physical function, which suggests that treatment strategies aimed at improving general physical function might not improve the patient's experience of PVD.

Previous studies that investigated the effect of a global treatment approach to vulvodynia included progressive muscle relaxation and abdominal breathing,[14] muscle control exercises,[31] deep breathing, global body relaxation, stretching of hip muscles,[19] joint mobilization,[32] myofascial release, muscle energy techniques and stabilizing exercises,[34] and global relaxation techniques, such as yoga and "autotraining."[35] Some of these studies are case reports with low internal and external validity, however. In addition, a prerequisite for applying these global techniques would be that the patient scores adversely on these functions as measured by a responsive, reliable, and valid instrument/tool, such as the SMT.[22]

Our findings suggest that young women with PVD do not demonstrate such impairments, and thus we question the value of interventions with the sole or preferential aim of improving general physical functioning in women with PVD who have no limitations in these domains. Non—evidence-based practices should be questioned,[36] and we must be mindful of the treatment burden on vulnerable patients[37] from therapies that might not address their primary impairments. However, our present study was not a randomized controlled trial, and we agree with Morin et al[10] that there is a need for robust and well-designed randomized controlled trials to determine the effect of different physiotherapy modalities in women with PVD.

Strengths of the present study are the inclusion of women with PVD diagnosed using recommended international methods,[8,38] contemporaneous comparison with age-matched controls, blinding of assessors, use of reliable and valid outcome measures, and assessment by experienced physiotherapists. A limitation is that the power calculation was based on assessment of pelvic floor muscle strength, and an a priori power calculation was not conducted for the SMT or the SF-36.[15] Owing to multiple testing, we used a Bonferroni calculation for the comparisons of different variables. However, the original *P* values reported in Tables 2 and 3 and show some trends and borderline statistically significant findings, with women with PVD scoring lower than the control group. This may be explained by multiple testing, but the lack of statistical significance also may be related to an inadequate sample size. All study participants were able to correctly contract the PFM, and as such, our results cannot be generalized to patients with no awareness of the pelvic floor or without the ability to contract the PFM.

Haugstad et al[22,25] defined the cutoff scores for best possible discrimination between patients with c chronic pelvic pain as 4.5 for all SMT domains. They found the greatest difference in scores in the domains of Gait (mean [SD], 2.70 [0.11] in patients vs 5.60 [0.09] in controls) and Respiration (2.88 [0.14] vs 5.63 [0.10]) on a scale of 0—7.[22] In our study, only 2 of 28 items on the SMT had a score of ≥4.5 (rotation in the gait domain for both groups and sagittal diagonal arm swing in the movement domain for the PVD group); thus, we question a cutoff value to indicate normal versus below-normal performance. We have not been able to find any other studies comparing the SF-36 and SMT in women with PVD, and thus our results can only be compared with a study finding that 60 patients with chronic pelvic pain had significantly lower scores on the SMT compared with 15 healthy controls.[24] However, the patients with chronic pelvic pain differed in age and parity compared with those in the present study, and thus a direct comparison of the studies is not possible. In addition, Haugstad et al did not control for multiple testing of findings. There is a need for more blinded case-control studies comparing physical function in women with and without PVD.

Some knowledge gaps remain in our understanding of PVD and its relationship with both general physical function and PFM function. Future studies could address some of these by considering which women may be at greatest risk of general physical and/or PFM dysfunction. These may include women with known comorbidities, such as past history of vaginal or urinary tract infections. In our study, we did not collect detailed histories related to these comorbidities; future research may find

the assessment of past history of infections and/or other known etiologic factors useful in furthering our understanding of PVD.

CONCLUSION

The women with PVD perceived their health as poorer compared with healthy controls, except in physical functioning. They did not differ from healthy controls in the ability to discriminate and control parts of the body, gait, respiration pattern, body posture in the standing and sitting position, or performance of different motor skills as assessed by the SMT. Thus, we suggest that these variables need to be assessed and deemed to be of clinical relevance in women with PVD before being included in intervention programs for this group of patients.

Corresponding Author: Ingrid Næss, MSc, University of Oslo, Department of Obstetrics and Gynecology, Institute of Health and Society, Lørenskog, Norway; Tel: 92435331; E-mail: ingrid.n@online.no

Conflicts of interest: The authors report no conflicts of interest.

Funding: None.

STATEMENT OF AUTHORSHIP

Category 1

(a) Conception and Design
Ingrid Næss; Helena C. Frawley; Kari Bø
(b) Acquisition of Data
Ingrid Næss; Helena C. Frawley; Kari Bø
(c) Analysis and Interpretation of Data
Ingrid Næss; Helena C. Frawley; Kari Bø

Category 2

(a) Drafting the Article
Ingrid Næss; Helena C. Frawley; Kari Bø
(b) Revising It for Intellectual Content
Ingrid Næss; Helena C. Frawley; Kari Bø

Category 3

(a) Final Approval of the Completed Article
Ingrid Næss; Helena C. Frawley; Kari Bø

REFERENCES

1. Bornstein J, Goldstein AT, Stockdale CK, et al. 2015 ISSVD, ISSWSH, and IPPS consensus terminology and classification of persistent vulvar pain and vulvodynia. **J Sex Med 2016;13:607-612.**
2. Pukall CF, Goldstein AT, Bergeron S, et al. Vulvodynia: Definition, prevalence, impact, and pathophysiological factors. **J Sex Med 2016;13:291-304.**
3. Morin M, Dumoulin C, Bergeron S, et al. Randomized clinical trial of multimodal physiotherapy treatment compared to overnight lidocaine ointment in women with provoked vestibulodynia: Design and methods. **Contemp Clin Trials 2016;46:52-59.**
4. Harlow BL, Stewart EG. A population-based assessment of chronic unexplained vulvar pain: Have we underestimated the prevalence of vulvodynia? **J Am Med Womens Assoc 2003;58:82-88.**
5. Danielsson I, Sjoberg I, Stenlund H, et al. Prevalence and incidence of prolonged and severe dyspareunia in women: Results from a population study. **Scand J Public Health 2003;31:113-118.**
6. Arnold LD, Bachmann GA, Rosen R, et al. Vulvodynia: Characteristics and associations with comorbidities and quality of life. **Obstet Gynecol 2006;107:617-624.**
7. Desrochers G, Bergeron S, Khalife S, et al. Fear avoidance and self-efficacy in relation to pain and sexual impairment in women with provoked vestibulodynia. **Clin J Pain 2009;25:520-527.**
8. Nunns D, Mandal D, Byrne M, et al. Guidelines for the management of vulvodynia. **Br J Dermatol 2010;162:1180-1185.**
9. Haefner HK, Collins ME, Davis GD, et al. The vulvodynia guideline. **J Low Genit Tract Dis 2005;9:40-51.**
10. Morin M, Carroll MS, Bergeron S. Systematic review of the effectiveness of physical therapy modalities in women with provoked vestibulodynia. **Sex Med Rev 2017;5:295-322.**
11. Reissing ED, Brown C, Lord MJ, et al. Pelvic floor muscle functioning in women with vulvar vestibulitis syndrome. **J Psychosom Obstet Gynaecol 2005;26:107-113.**
12. Gentilcore-Saulnier E, McLean L, Goldfinger C, et al. Pelvic floor muscle assessment outcomes in women with and without provoked vestibulodynia and the impact of a physical therapy program. **J Sex Med 2010;7:1003-1022.**
13. Morin M, Binik YM, Bourbonnais D, et al. Heightened pelvic floor muscle tone and altered contractility in women with provoked vestibulodynia. **J Sex Med 2017;14:592-600.**
14. Bergeron S, Binik YM, Khalife S, et al. A randomized comparison of group cognitive-behavioral therapy, surface electromyographic biofeedback, and vestibulectomy in the treatment of dyspareunia resulting from vulvar vestibulitis. **Pain 2001;91:297-306.**
15. Næss I, Bo K. Pelvic floor muscle function in women with provoked vestibulodynia and asymptomatic controls. **Int Urogynecol J 2015;26:1467-1473.**
16. Rosenbaum TY, Owens A. The role of pelvic floor physical therapy in the treatment of pelvic and genital pain-related sexual dysfunction (CME). **J Sex Med 2008;5:513-523.**
17. Backman H, Widenbrant M, Bohm-Starke N, et al. Combined physical and psychosexual therapy for provoked vestibulodynia-an evaluation of a multidisciplinary treatment model. **J Sex Res 2008;45:378-385.**
18. Næss I, Bo K. Can maximal voluntary pelvic floor muscle contraction reduce vaginal resting pressure and resting EMG activity? **Int Urogynecol J 2018;29:1623-1627.**
19. Goldfinger C, Pukall CF, Thibault-Gagnon S, et al. Effectiveness of cognitive-behavioral therapy and physical therapy for

provoked vestibulodynia: A randomized pilot study. **J Sex Med 2016;13:88-94.**

20. Goldstein AT, Pukall CF, Brown C, et al. Vulvodynia: Assessment and treatment. **J Sex Med 2016;13:572-590.**
21. Haugstad GK, Haugstad TS, Kirste UM, et al. Posture, movement patterns, and body awareness in women with chronic pelvic pain. **J Psychosom Res 2006;61:637-644.**
22. Haugstad GK, Haugstad TS, Kirste U, et al. Reliability and validity of a standardized Mensendieck physiotherapy test (SMT). **Physiother Theory Pract 2006;22:189-205.**
23. Haugstad GK, Haugstad TS, Kirste UM, et al. Mensendieck somatocognitive therapy as treatment approach to chronic pelvic pain: Results of a randomized controlled intervention study. **Am J Obstet Gynecol 2006;194:1303-1310.**
24. Haugstad GK, Haugstad TS, Kirste UM, et al. Continuing improvement of chronic pelvic pain in women after short-term Mensendieck somatocognitive therapy: Results of a 1-year follow-up study. **Am J Obstet Gynecol 2008;199:615-618.**
25. Haugstad GK, Wojniusz S, Kirste UM, et al. Pain, psychological distress and motor pattern in women with provoked vestibulodynia (PVD)—symptom characteristics and therapy suggestions. **Scand J Pain 2018;18:221-227.**
26. Hilde G, Staer-Jensen J, Ellstrom EM, et al. Continence and pelvic floor status in nulliparous women at midterm pregnancy. **Int Urogynecol J 2012;23:1257-1263.**
27. Ware JE Jr, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36), I: Conceptual framework and item selection. **Med Care 1992;30:473-483.**
28. Loge JH, Kaasa S, Hjermstad MJ, et al. Translation and performance of the Norwegian SF-36 Health Survey in patients with rheumatoid arthritis, I: Data quality, scaling assumptions, reliability, and construct validity. **J Clin Epidemiol 1998;51:1069-1076.**
29. Ware JE, Kosinski M, Dewey JE. How to score version 2 of the SF-36 Health Survey (Standard and Acute forms). 3rd ed. Lincoln, RI: QualityMetric; 2000.
30. Pukall CF, Bergeron S, Brown C, et al. Recommendations for self-report outcome measures in vulvodynia clinical trials. **Clin J Pain 2017;33:756-765.**
31. Fisher KA. Management of dyspareunia and associated levator ani muscle overactivity. **Phys Ther 2007;87:935-941.**
32. Hartmann D, Nelson CA. The perceived effectiveness of physical therapy treatment on women complaining of chronic vulvar pain and diagnosed with either vulvar vestibulitis syndrome or dysesthetic vulvodynia. **J Section Womens Health 2001;25:13-18.**
33. Benoit-Piau J, Bergeron S, Brassard A, et al. Fear-avoidance and pelvic floor muscle function are associated with pain intensity in women with vulvodynia. **Clin J Pain 2018;34:804-810.**
34. Holland A. Physical therapy intervention for dyspareunia: A case report. **J Section Womens Health 2003;27:18-20.**
35. Bogliatto F, Miletta M. Role of the physical therapy in the multidisciplinary approach to vulvodynia. Presented at the XXIII Congress of the International Society for the Study of Vulvovaginal Disease (ISSVD). July 27–29; 2015; New York, NY.
36. Levinson W, Kallewaard M, Bhatia RS, et al. "Choosing Wisely": A growing international campaign. **BMJ Qual Saf 2015;24:167-174.**
37. May C, Montori VM, Mair FS. We need minimally disruptive medicine. **BMJ 2009;339:b2803.**
38. Stockdale CK, Lawson HW. 2013 Vulvodynia guideline update. **J Low Genit Tract Dis 2014;18:93-100.**