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CLINICAL ARTICLE

Psychosexual correlates of persistent postsurgical pain in patients with vulvodynia

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ABSTRACT

Objective: To examine long-term reports of pain and psychologic correlates of pain in women after vestibulectomy. *Methods:* In a retrospective cross-sectional exploratory study, 37 women who had undergone vestibulectomy between January 1989 and January 2008 completed questionnaires assessing demographic information, self-reported levels of pain, anxiety, somatization, psychologic distress, and sexual function. *Results:* Eight women reported being completely pain free after surgery. The remaining 29 women reported various levels of pain during intercourse (as measured by the Gracely pain scale) and decreased sexual function (as measured by a sexual functioning questionnaire). Various measures of psychologic distress were associated with average intercourse-related pain, including brief symptom inventory ($P=0.002$), Pennebaker inventory of limbic languidness ($P=0.002$), perceived stress scale ($P=0.04$), and Spielberger trait–anxiety inventory ($P=0.01$). These same measures of psychological distress were similarly associated with general, unprovoked vaginal pain. *Conclusion:* The present data suggest that the pathophysiology of localized vulvodynia may be more complex in some women, leading to a suboptimal response to surgical treatment.

1. Introduction

Localized, provoked vestibulodynia (formerly known as vulvar vestibulitis syndrome) is the most frequent cause of superficial dyspareunia in women of reproductive age [1]. Akin to other idiopathic pain disorders, the etiology of localized vestibulodynia is thought to be multifactorial with a range of abnormalities in the vestibular mucosa, underlying musculature, and central nervous system [1]. The extent to which these abnormalities contribute to the development and maintenance of pain in individual patients, however, remains unknown. Although various therapeutics have been proposed to treat this disorder, surgical removal of the affected vulvar mucosa is thought to be most effective, with a reported success rate of 50%–90% in previous studies [2].

Over time, various modifications of surgical procedures have come in and out of favor, most commonly because of subsequent reports of higher complications or limited efficacy [3]. At present, the most common form of this procedure involves resection of the vestibule encompassing the lower half of the genital hiatus. Modern vestibulectomy involves removal of the hymeneal ring from approximately the 3 o'clock to the 9 o'clock position and the vestibular mucosa confined to Hart's line to a depth of 2–3 mm [2]. Although many publications covering decades of research have endorsed the effectiveness of vestibulectomy, little is known about the clinical factors associated with treatment outcomes [2]. Most studies are difficult to compare owing to variations in surgical technique, methodologic limitations, short follow-up periods, and limited outcome measures.

In the largest retrospective study of postoperative outcomes ($n=67$) so far, women with a life-long history of pain (primary vestibulodynia) were found to be significantly less likely to respond to surgery than those who developed the condition later in life [2]. Similarly, Granot et al. [4] demonstrated that systemic sensitivity and co-morbid pain conditions were associated with poor treatment outcomes [4].

The aim of the present pilot study was to investigate long-term reports of pain, psychosocial variables, and the sexual health of patients after vestibulectomy by using structured questionnaires. A related objective was to confirm and expand the findings of other investigators by using the present study population.

2. Materials and methods

The present cross-sectional study was conducted in the Department of Obstetrics and Gynecology, University of North Carolina School of Medicine, North Carolina, USA, between May 1 and August 28, 2008, and was approved by the Institutional Review Board at the University of North Carolina. All women ($n=99$) who had undergone vestibulectomy between January 1989 and January 2008 were identified by querying the

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surgical registry. In our department, vestibulectomy is offered as the treatment of last resort and is conducted in a manner described by Bohm-Starke and Rylander [2]. Most of the procedures were performed by 2 surgeons, 1 of whom was trained by the other.

A package containing consent forms, study materials, and a pre-stamped envelope was mailed to potential participants. Of the 99 envelopes, 76 were received back, of which 33 were marked as "returned to sender" by the post office. The remaining 43 envelopes were from women who had either declined to participate (n = 5) or completed the study material (n = 38). We did not receive any response from 23 women. Of the 38 women who returned the study material, 1 was excluded because the survey was completed within the postoperative period. Thus, the present study sample consisted of 37 women who completed the study questionnaires.

Participants completed several questionnaires assessing the severity of their vulvovaginal pain and psychologic traits. Vaginal pain was measured by the Gracely pain scale [5], which asks patients to self-report their lowest, average, and maximal vaginal pain on a scale of 0 to 100 [6]. Note that the pain ratings and psychologic scores were ascertained retrospectively; there are no data on the participants' pain ratings or psychologic scores prior to surgery.

To assess psychologic traits, we used the following psychometric instruments. First, the brief symptom inventory (BSI) consists of 53 items rating psychologic distress in 9 areas: somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism [7]. A global severity index is obtained by combining the number and intensity of reported symptoms [7]. Internal consistency using Cronbach α for the 9 BSI dimensions ranges from a low of 0.75 for the psychoticism dimension to a high of 0.85 for the depression dimension [7]. Test–retest validity for the global severity index score is 0.90 [7]. Second, the perceived stress scale (PSS) is a 10-item questionnaire that is designed to measure the degree to which situations in life are appraised as stressful [8]. This instrument also has high internal consistency (α = 0.84–0.86) and good test–retest reliability (r = 0.55–0.85) [8]. Third, the Spielberger state–trait anxiety inventory (STAIY) consists of 2 questionnaires each containing 20 items: 1 assesses current (state) anxiety, and the other assesses general propensity to experience anxiety (trait) [9]. This instrument has good test–retest reliability (r = 0.73–0.86) and internal consistency (α = 0.83–0.92) [9], and is widely used to assess anxiety in medical settings. Fourth, the Pennebaker inventory of limbic languidness (PILL) assesses somatization by capturing the frequency of occurrence of 54 common physical symptoms and sensations [10]. It has high internal consistency (α = 0.88) and adequate test–retest reliability (r = 0.70 for a 2-month period) [10].

We also administered the sexual function questionnaire (SFQ) [11], which is a 34-item questionnaire that assesses female sexual dysfunction. It contains 7 subscales: desire, arousal—sensation, arousal—lubrication, orgasm, enjoyment, pain, and partner. The internal consistency of the various domains ranges from 0.65 to 0.89, and test–retest reliability ranges from 0.42 to 0.78 [11].

Descriptive statistics (mean ± SD) were calculated for continuous variables, and frequency and percentages were calculated for bivariate variables for the whole cohort. The distributions of the pain variables and psychologic characteristics were subsequently compared between 2 groups (i.e. pain free versus persistent pain) by using the *t* test for continuous variables and the Pearson χ^2 test for categoric variables. If a cell had an expected count of less than 5 when computing the χ^2 statistic, the *P* value was approximated by Monte Carlo simulation. All calculations were performed with R version 2.11 (R Core Development Team, Vienna, Austria).

To investigate the relationship between persistent pain and indices of psychologic distress, the Pearson correlation coefficient was calculated between each of the 5 psychologic questionnaires (BSI, PSS, state anxiety, trait anxiety, and PILL) and a patient's self-reported pain rating. Six possible pain ratings were considered: average pain level, worst pain level, and lowest pain level for both general vaginal pain and intercourse-related pain. For each correlation, a *P* value was calculated for testing the null hypothesis that the correlation was equal to 0. The correlation among the psychologic variables was also calculated.

3. Results

The study cohort consisted primarily of college-educated (83.8%), married (81.1%), white (97.3%) women aged 24 to 54 years. The demographic and clinical variables of interest did not differ among women with or without persistent postoperative pain (Table 1). In particular, there was no significant correlation between persistent postoperative pain and time elapsed since surgery.

Twenty-two percent (n = 8) of responders indicated that they were pain free by answering affirmatively to the question "Are you pain free?", and by reporting a pain level of "0" on the modified Gracely pain scale (Table 1). Persistent pain with intercourse (provoked pain) was highly correlated with unprovoked pain: 40.9% of women who experienced persistent pain during intercourse also experienced some severity of unprovoked pain.

Similarly, significant differences in the psychologic characteristics were observed among the 2 groups. Women with persistent pain had significantly higher levels of global distress (BSI, $P<0.001$), perceived stress (PSS, $P = 0.034$), trait anxiety (STAIY, $P = 0.017$), and somatization (PILL, $P = 0.010$).

Next, measures of sexual response and satisfaction (as measured by the SFQ) were compared between the 2 groups. Patients with persistent pain consistently reported lower scores on each of the SFQ subscales as compared with pain-free patients (Table 2). Similarly, women with persistent pain had scores that were significantly lower than the population norm on each of the 7 SFQ subscales [11] (Table 2). With notable exception of the desire and enjoyment subscales, by contrast, pain-free patients did not significantly differ from the population norm.

Correlations between the patients' reported pain levels and their various psychologic scores were also examined. Participants' scores on each of the 5 psychologic instruments were positively correlated with their pain score. Most of these correlations were very strong, with correlation coefficients between 0.265 and 0.698. Of the 30 correlations considered, all but 6 were greater than 0.4 (Table 3). All but one of the coefficients were significantly different from 0 at the

Table 1
Characteristics of women with and without persistent postoperative pain.[a]

Patient characteristics	Pain (n = 29)	No pain (n = 8)	*P* value
Age, y	35.86 ± 1.47	39.25 ± 3.05	0.340
Time since surgery, y	5.10 ± 0.62	8.70 ± 2.02	0.125
Married	23 (79.3)	7 (87.5)	0.671
Caucasian	29 (100)	7 (87.5)	0.221
College education or beyond	23 (79.3)	8 (100)	0.312
No. of pregnancies	1.00 ± 0.29	1.75 ± 0.45	0.186
Unprovoked vaginal pain, % of day with pain	13.21 ± 4.46	0	0.006
Unprovoked vaginal pain			
Average	10.34 ± 3.35	0	0.004
High	19.48 ± 5.69	0	0.002
Low	3.97 ± 1.93	0	0.049
Intercourse-related pain			
Average	31.46 ± 5.45	0	<0.001
High	48.12 ± 6.43	0	<0.001
Low	19.42 ± 5.49	0	0.002
BSI	0.847 ± 0.141	0.219 ± 0.077	<0.001
PSS	17.55 ± 1.59	11.38 ± 2.13	0.034
STAIY (state)	39.32 ± 2.86	30.38 ± 3.64	0.070
STAIY (trait)	43.48 ± 2.92	31.38 ± 3.53	0.017
PILL	121.73 ± 5.92	94.63 ± 7.31	0.010

Abbreviations: BSI, brief symptom inventory; PSS, perceived stress scale; STAIY, Spielberger state–trait anxiety inventory; PILL, Pennebaker inventory of limbic languidness.
[a] Values are given as mean ± SD or number (percentage) unless otherwise indicated.

Table 2
Comparison of sexual function questionnaire score to population norm.

Sexual functioning domain	Normative value	Pain (n = 29) [a]	*P* value [b]	No pain (n = 8) [a]	*P* value [b]
Desire	22.39	14.8 ± 1.10	<0.001	16.63 ± 1.29	0.002
Arousal: sensation	14.93	9.50 ± 0.97	<0.001	12.75 ± 1.54	0.201
Arousal: lubrication	7.78	4.74 ± 0.45	<0.001	6.63 ± 0.84	0.213
Orgasm	11.91	8.52 ± 1.15	0.007	9.75 ± 1.50	0.192
Enjoyment	24.43	17.51 ± 1.31	<0.001	20.21 ± 1.68	0.041
Pain	14.74	9.54 ± 0.73	<0.001	14.38 ± 0.38	0.363
Partner	9.76	7.82 ± 0.79	0.020	9.38 ± 0.26	0.187

[a] Values are given as mean ± SD unless otherwise indicated.
[b] *P* values test the null hypothesis that the mean score in each group (pain or no pain) is equal to the normative score in the population.

Table 4
Correlations between psychologic variables.

ψ variables	Pearson correlation coefficient [a]				
	BSI	PILL	STAIY (state)	STAIY (trait)	PSS
BSI	1				
PILL	0.802	1			
STAIY (state)	0.871	0.656	1		
STAIY (trait)	0.880	0.691	0.931	1	
PSS	0.829	0.615	0.844	0.867	1

Abbreviations: BSI, brief symptom inventory; PILL, Pennebaker inventory of limbic languidness; STAIY, Spielberger state–trait anxiety inventory; PSS, perceived stress scale.
[a] All correlations were significant at $P<0.001$.

$P<0.05$ significance level. This is strong evidence that higher levels of psychologic distress are associated with higher pain scores.

Lastly, correlations among the different psychologic measures were calculated. All of the correlations were very strong, with correlation coefficients between 0.615 and 0.931. All of the coefficients were significantly different from 0 at the $P<0.001$ significance level (Table 4).

Because multiple hypothesis tests were performed, the usual $P<0.05$ criteria for statistical significance may be too liberal. Although the probability of a single type-I error is 0.05, the probability of making at least 1 type-I error after performing 62 hypothesis tests in Tables 1–3 is much greater than 0.05. This issue could be avoided by using a Bonferroni correction and by requiring a value of $P<0.001$ (0.05/62) for a test to be called statistically significant. For the present study, a Bonferroni correction is probably overly conservative. Many of the variables in the study (e.g. high, low, and average pain levels, and the psychologic variables) are very strongly correlated with each another, so the true number of independent tests is far less than 62. If we wish to err on the side of caution, however, we note that the main conclusions derived from Tables 2 and 3 are still valid even if we use the $P<0.001$ criteria for statistical significance. In particular, the difference between the SFQ scores for patients with persistent pain and those for the population norm is significant at the $P<0.001$ level for 5 of the 7 scores, and the association between pain after surgery and psychologic distress levels is significant at the $P<0.001$ level for several of the correlations.

4. Discussion

In the present study, 8 (22%) participants indicated being pain free at an average of 8.7 years after vestibulectomy. Notably, when these 8 women were asked what treatment was most effective for their pain, all 8 responded with the answer "surgery". Nevertheless, most respondents continued to experience persistent pain with associated psychologic distress and sexual dysfunction. These findings present a counseling and treatment dilemma for clinicians, because surgery seems to be highly effective for some patients but not others. Thus, it is imperative to identify a set of clinical variables that can be used to predict surgical outcomes.

In the present study, there was a significant association between psychologic distress and persistent pain state. Although causation cannot be established in a retrospective study, this result suggests the possibility that psychologic distress may be a predictor of poor surgical outcomes. Ample evidence shows that women with vestibulodynia have higher levels of psychologic distress than women without pain [1,4,12,13]. Moreover, women who experience significant psychologic distress are less likely to respond to treatment [4,14,15].

Certain psychologic characteristics may precede or be affected by persistent pain [1,6,16]. When psychologic distress is measured at 1 point in time (e.g. postoperative period), however, it is difficult to determine the nature of the association (causal versus consequence). Psychologic distress may be secondary to a chronic pain state, although traits (e.g. pre-existing mild subclinical anxiety) may modify state (e.g. clinically significant co-morbid anxiety) with chronicity [13]. Alternatively, a psychologic trait may be an independent risk factor—necessary but not sufficient—for developing chronic pain. Under this model, psychologic factors are one of many variables that contribute to chronic pain, much like the "multifactorial model" for cancer where individual vulnerability is necessary but not sufficient for the development of cancer. In fact, for several idiopathic pain conditions, including temporomandibular disorder and irritable bowel syndrome, psychologic distress has been shown to precede the condition and to be an independent risk factor [17,18]. Given the high co-morbidity of idiopathic pain conditions, specifically irritable bowel syndrome and temporomandibular disorder [6,19], with vulvodynia, it is plausible that a similar association might be observed if a prospective study on putative risk factors for vulvodynia were to be conducted.

The correlation between psychologic distress and persistent postoperative pain, coupled with high co-morbidity among chronic pain disorders, suggests that "an inherent susceptibility may precede and permit the development of vulvodynia in certain subgroups" of

Table 3
Correlations between pain rating and psychologic variables.

Pain rating	Pearson correlation coefficient (*P* value)				
	BSI	PILL	STAIY (state)	STAIY (trait)	PSS
Unprovoked vaginal pain					
Average	0.638 (<0.001)	0.444 (0.006)	0.511 (0.001)	0.519 (0.001)	0.513 (0.001)
High	0.695 (<0.001)	0.605 (0.001)	0.505 (0.001)	0.530 (0.001)	0.465 (0.004)
Low	0.556 (<0.001)	0.265 (0.113)	0.451 (0.005)	0.443 (0.006)	0.478 (0.003)
Intercourse-related pain					
Average	0.506 (0.002)	0.509 (0.002)	0.379 (0.027)	0.416 (0.014)	0.358 (0.038)
High	0.455 (0.007)	0.437 (0.010)	0.339 (0.050)	0.418 (0.014)	0.341 (0.048)
Low	0.571 (<0.001)	0.540 (0.001)	0.446 (0.008)	0.411 (0.016)	0.388 (0.023)

Abbreviations: BSI, Brief symptom inventory; PILL, Pennebaker inventory of limbic languidness; STAIY, Spielberger state–trait anxiety inventory; PSS, perceived stress scale.

women [13]. The relationship between psychologic traits and chronic pain conditions may partially be explained by genetic differences. For example, variation in the gene encoding catechol-O-methyltransferase is associated with psychologic distress [13,20,21].

The present study is limited owing to its small sample size and retrospective cross-sectional design. Thus, we are unable to prove that a causal relationship exists between psychologic distress and the surgical outcome. We can, however, estimate the likelihood of a causal relationship, even if we cannot make any firm conclusions without additional studies. In epidemiology, Bradford-Hill criteria [22] are commonly used to evaluate evidence of causation. On the basis of these criteria, there is evidence that psychologic distress does indeed reduce the probability that surgery will be successful.

First, the correlation between the psychologic distress measures and pain measures was very strong (Table 3); for example, the correlation between BSI and the highest reported general vaginal pain level was nearly 0.7. Second, we observed a dose–response relationship between psychologic distress and pain levels. Not only did patients with persistent pain report higher levels of psychologic distress than pain-free patients, but patients' pain ratings increased as their levels of psychologic distress increased. Third, these results are consistent with earlier studies. Patients with orofacial pain (which is co-morbid with vestibulodynia) and high levels of psychologic distress are less likely to respond to treatment [23]. Similarly, patients with vestibulodynia with unprovoked pain before surgery are less likely to experience pain relief after surgery [24], as are women with co-morbid pain disorders [4]. In addition, patients with vulvodynia with high levels of psychologic distress show heightened sensitivity to pain in non-genital areas (central sensitization) [25].

Thus, the logical extension of existing data supports the notion that, if pain is not completely localized to the vulvar vestibule (which is likely to be the case among women with high levels of psychologic distress, co-morbid pain disorders, and somatic pain sensitivity), then surgery alone may not be sufficient in providing long-term relief.

On the basis of the present data, the exact nature of the relationship between psychologic distress and surgical outcomes is still unclear. Nevertheless, these limited data are intriguing. Given the fact that many women continue to experience pain after surgery for vestibulodynia, it is clear that there is an urgent need to identify risk factors associated with poor outcomes. The present data suggest that psychologic distress (as measured by various questionnaires) is a possible risk factor. We hope that these results will motivate a prospective study that can evaluate this hypothesis more thoroughly.

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Conflict of interest

The authors have no conflicts of interest.

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