GYNECOLOGY

Multimodal physical therapy versus topical lidocaine for provoked vestibulodynia: a multicenter, randomized trial

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BACKGROUND: Provoked vestibulodynia is the most common subtype of chronic vulvar pain. This highly prevalent and debilitating condition is characterized by acute recurrent pain located at the entry of the vagina in response to pressure application or attempted vaginal penetration. Although physical therapy is advocated as a first-line treatment for provoked vestibulodynia, evidence supporting its efficacy is scarce.

OBJECTIVE: The purpose of this study was to establish the efficacy of multimodal physical therapy compared with topical lidocaine, a frequently used first-line treatment.

STUDY DESIGN: We conducted a multicenter, parallel-group, randomized clinical trial in women diagnosed as having provoked vestibulodynia recruited from the community and 4 Canadian university hospitals. Women were randomly assigned (1:1) to receive either weekly sessions of physical therapy or overnight topical lidocaine (5% ointment) for 10 weeks. Randomization was stratified by center using random permuted blocks from a computer-generated list managed by an independent individual. Physical therapy entailed education, pelvic floor muscle exercises with biofeedback, manual therapy, and dilation. Assessments were conducted at baseline, posttreatment, and 6-month follow-up. Outcome assessors, investigators, and data analysts were masked to allocation. The primary outcome was pain intensity during intercourse evaluated with the numeric rating scale (0—10). Secondary outcomes included pain quality (McGill-Melzack Pain Questionnaire), sexual function (Female Sexual Function Index), sexual distress (Female Sexual Distress Scale), satisfaction (numeric rating scale of 0—10), and participants' impression of change (Patient Global Impression of Change). Intention-to-treat analyses were conducted using piecewise linear-growth models.

RESULTS: Among 212 women who were recruited and randomized, 201 (95%) completed the posttreatment assessment and 195 (92%) completed the 6-month follow-up. Multimodal physical therapy was more effective than lidocaine for reducing pain intensity during intercourse (between-group pre-post slope difference, $P<.001$; mean group post-difference, 1.8; 95% confidence interval, 1.2—2.3), and results were maintained at 6-month follow-up (mean group difference, 1.8; 95% confidence interval, 1.2—2.5). The physical therapy group also performed better than the lidocaine group in all secondary outcomes (pain quality, sexual function, sexual distress, satisfaction, and participants' impression of change) at posttreatment and 6-month follow-up. Moreover, the changes observed after physical therapy were shown to be clinically meaningful. Regarding participants' impression of change, 79% of women in the physical therapy group reported being very much or much improved compared with 39% in the lidocaine group ($P<.001$).

CONCLUSION: The findings provide strong evidence that physical therapy is effective for pain, sexual function, and sexual distress and support its recommendation as the first-line treatment of choice for provoked vestibulodynia.

Key words: biofeedback, chronic pelvic pain, manual therapy, pain education, pelvic floor, physiotherapy, psychological distress, randomized clinical trial, rehabilitation, sexual dysfunction, vulvodynia, women's health

Introduction

Vulvodynia or chronic vulvar pain has a prevalence rate as high as 7% to 16%.[1,2] Although vulvodynia is as frequent as other well-known chronic pain conditions such as low back pain, arthrosis, or fibromyalgia,[3] it remains poorly understood, often misdiagnosed, or even ignored by health professionals.[4] Vulvodynia leads to high psychological distress, significant disruption in all aspects of sexual function, and altered quality of life.[5] In addition, vulvodynia carries an annual economic burden of $31 to $72 billion in the United States.[6] The principal subtype of vulvodynia, provoked vestibulodynia (PVD), is characterized by pain upon pressure at the vulvar vestibule or attempted vaginal penetration.[7] Women multiply their medical visits in hopes of finding relief and are confronted with limited effective treatment options.[4] Indeed, well-designed randomized trials have thus far failed to prove the efficacy of first-line medical treatments for reducing pain in women with PVD (eg, gabapentin, tricyclic antidepressant, botulinum toxin).[8—10]

Physical therapy, usually consisting of biofeedback, pelvic floor muscle exercises, manual therapy, dilation, and education,[11] may potentially fill this therapeutic void and is perceived as the most effective intervention according to medical experts.[12] However, the efficacy of physical therapy is supported only by small uncontrolled or pilot studies showing significant reductions in pain and improvements in sexual function.[13—16] As stated in a recent systematic review,[17] reliable evidence based on randomized trials is needed to confirm these promising findings. Topical lidocaine is currently the most

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AJOG at a Glance

Why was this study conducted?

This study was conducted to determine the efficacy of multimodal physical therapy in women with provoked vestibulodynia (PVD) in comparison with topical lidocaine, a frequently prescribed first-line medical intervention.

Key findings

Multimodal physical therapy showed both statistically significant and clinically meaningful improvements after treatment compared with overnight topical lidocaine for pain intensity and all secondary outcomes (pain quality, sexual function, sexual distress, satisfaction, and participants' impression of change). All benefits of physical therapy were maintained at 6-month follow-up.

What does this add to what is known?

Findings from this study confirm that multimodal physical therapy is effective for PVD and thereby provide robust evidence for recommending physical therapy as the preferred first-line treatment.

frequently prescribed first-line intervention.[12] In a single-arm prospective study by Zolnoun et al,[18] overnight 5% lidocaine ointment significantly reduced pain and improved sexual function. This application and dose seem more effective than other available applications (eg, repeated daily application, 2% or 5% lidocaine diluted in hydrating cream) because they were shown noneffective in 2 randomized trials.[9,19] Therefore, we conducted a randomized clinical trial to determine the efficacy of physical therapy in women with PVD compared with overnight topical lidocaine.

Materials and Methods

Study design

In this randomized, parallel-group, multicenter, clinical trial, physical therapy was compared with a frequently prescribed first-line medical treatment, topical lidocaine. Ethics approval for the trial was granted by the Research Ethics Board of the 2 directing sites (Sherbrooke and Montréal, QC, Canada) and participating hospitals. The study was registered in ClinicalTrials.gov (NCT01455350), and the details of the study protocol were published previously.[20]

Participants

Participants were recruited between May 2012 and August 2015 by means of posters in universities, medical clinics and stores, web initiatives, referrals by health professionals, newspaper ads, and public conferences. Nulliparous women, aged 18 to 45 years were included if they reported pain during sexual intercourse for >6 months with an average intensity of ≥5 of 10 on a numeric rating scale (NRS). Women also had their diagnosis of PVD confirmed by the study gynecologists according to current recommendations (eg, differential diagnoses including infections were ruled out, and a positive cotton swab test was obtained).[20] The main exclusion criteria were (1) other urogynecologic and vulvar pain conditions (eg, unprovoked pain, deep dyspareunia), (2) previously received physical therapy or overnight lidocaine, and (3) any coexisting significant medical conditions that were likely to interfere with the study procedures. More details on eligibility criteria are available elsewhere.[20]

Randomization and masking

Women who met the eligibility criteria after a phone screening interview and a gynecologic assessment underwent a baseline assessment. Participants were then randomized (1:1) to receive physical therapy or lidocaine for 10 weeks. Randomization was stratified by center using random permuted blocks (size, 4−6) from a computer-generated list designed by an independent statistician. This concealed randomization list was thereafter managed by an independent individual who assigned participants. Investigators, data analysts, gynecologists and outcome evaluators (trained physical therapist not involved in treatments) remained blinded to group allocation.

Interventions

Physical therapy treatment consisted of 10 weeks of individual 1-hour sessions (Appendix). The physical therapists providing treatments were all certified physical therapists with postgraduate qualifications in women's health including courses in pelvic pain. They had all received a standardized training for the treatment protocol and had access to mentoring and supervision when needed. The modalities composing the standardized physical therapy treatment protocol were selected to reflect current clinical practice.[11] As an important component of physical therapy, the educational program included various topics such as chronic pain management, muscle pathophysiology, and sexual functioning. Manual therapy techniques, applied for 20 to 25 minutes, were adapted to each participant's condition (eg, the amount of pressure varied according to tolerance) and evolved throughout the sessions. They consisted of vulvar desensitization, pelvic floor muscle stretching, myofascial release, conjunctive tissue manipulation, and neuromuscular reeducation. Similar techniques were also applied to the hip and abdominal muscles. The pelvic floor muscle exercises assisted by biofeedback were practiced for 20 minutes to improve muscle relaxation and function. The home exercise program incorporated pelvic floor contractions (5 times per week) and stretching exercises using a dilator and vestibule tissue mobilization (3 times per week).

The overnight topical lidocaine treatment was based on the application protocol described by Zolnoun et al.[18] Participants were asked to apply a copious amount of lidocaine 5% ointment (50 mg/g, 35 g; Lidodan, Odan Laboratories Ltd, Canada) on the vestibule area at bedtime. They also had to place a small gauze containing ointment

(the size of a marble) at the vestibule area and maintain continuous contact through the night for ≥8 hours. In addition to written instructions, the research coordinator carefully explained the procedure to each participant and followed up with weekly phone calls.

Study outcomes

Participants were convened to an assessment session conducted by a trained physical therapist blinded to group assignment at baseline, posttreatment, and 6-month follow-up. The primary outcome was the average pain intensity during intercourse on an NRS (from 0, no pain, to 10, the worst possible pain) measured at baseline, posttreatment, and 6-month follow-up. Recommended by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials[21] and a vulvodynia outcome consensus group,[22] this scale has been widely used in clinical trials for vulvodynia and other chronic pain conditions and has shown excellent psychometric properties.[17,21] The pain intensity rating can be categorized as mild (1−4), moderate (5−6), or severe (7−10)[23]; a reduction of 1.5% or 30% is indicative of a minimal clinically important difference (MCID).[21]

Secondary outcomes were measured with validated self-administered questionnaires at the 3 time points. Pain quality including its sensory, affective, and evaluative components was assessed with the McGill-Melzack Pain Questionnaire (MPQ).[24] The Female Sexual Function Index was used as a multidimensional measure of sexual function, which encompasses desire, arousal, lubrication, orgasm, and satisfaction.[25] Sexually related distress was evaluated with the Female Sexual Distress Scale.[26] Additional secondary outcomes pertaining to treatment effects on psychological variables and pelvic floor muscle morphology and function were collected and will be presented in further publications.

Satisfaction with treatment was evaluated at posttreatment and at 6-month follow-up by 1 question (from 0, completely dissatisfied, to 10, completely satisfied). The Patient Global Impression of Change (PGIC) was employed to evaluate perceived reduction in pain using a 7-point scale.[21] Treatment adherence was evaluated by means of a participant daily diary that was reviewed weekly by the treating physical therapist or, for women in the lidocaine group, by the research coordinator during weekly phone call. The percentages of exercises completed or ointment applied were considered. Participants were also asked to report any side effects and the use of any other treatment throughout their participation in the study.

Statistical analyses

The total sample size estimate of 212 was based on the primary outcome of pain during sexual intercourse using the NRS. Statistical power analysis examined the requirements to detect the most conservative MCID of 1.5 points between the 2 treatments (2-sided α, 0.05; power, 0.80; standard deviation, 3.47[18]) and an expected dropout of 20% (further justification available elsewhere[20]). Intention-to-treat analyses were conducted to evaluate the efficacy of the 2 interventions using a multilevel model of change adjusted for the directing sites.[27] Multilevel models of change (using SAS PROC MIXED, SAS Institute, Cary, NC) were used as proposed by Singer and Willett.[27] The primary outcome and continuous secondary outcomes were analyzed in relation to values at the different time points, slopes between time points, and differences in slopes between treatments. This type of analysis was selected because it takes into account the dependency between repeated measures without requiring identical intervals between time points.[27] A piecewise linear-growth model was estimated as we anticipated the slope between baseline and posttreatment evaluations being steeper than that at 6-month follow-up. Time was considered as an independent variable and treatment outcomes as dependent variables.

As for the treatment group, site was entered into the model as a fixed factor because no clustering effect was expected. Missing data were few (<8%), and multilevel models allowed us to use partial data from women who did not participate in all measurements. Therefore, no additional treatment of missing data was undertaken because it has been suggested that it is not necessary with <10% of missing data[28] and multiple imputations should not be used with longitudinal data analyzed with mixed-effects models.[29,30] Chi-square tests were used to compare the 2 groups for the proportion of participants presenting meaningful clinical changes and for outcomes pertaining to the participant's impression of change. The number needed to treat (NNT) was computed with 95% confidence interval (CI) to help translate the dichotomous findings into clinically useful counseling points. Statistical analyses were performed with SAS 9.4 (SAS Institute) and SPSS 24 (IBM software, Armonk, NY) at the 5% level (2 sided).

Results

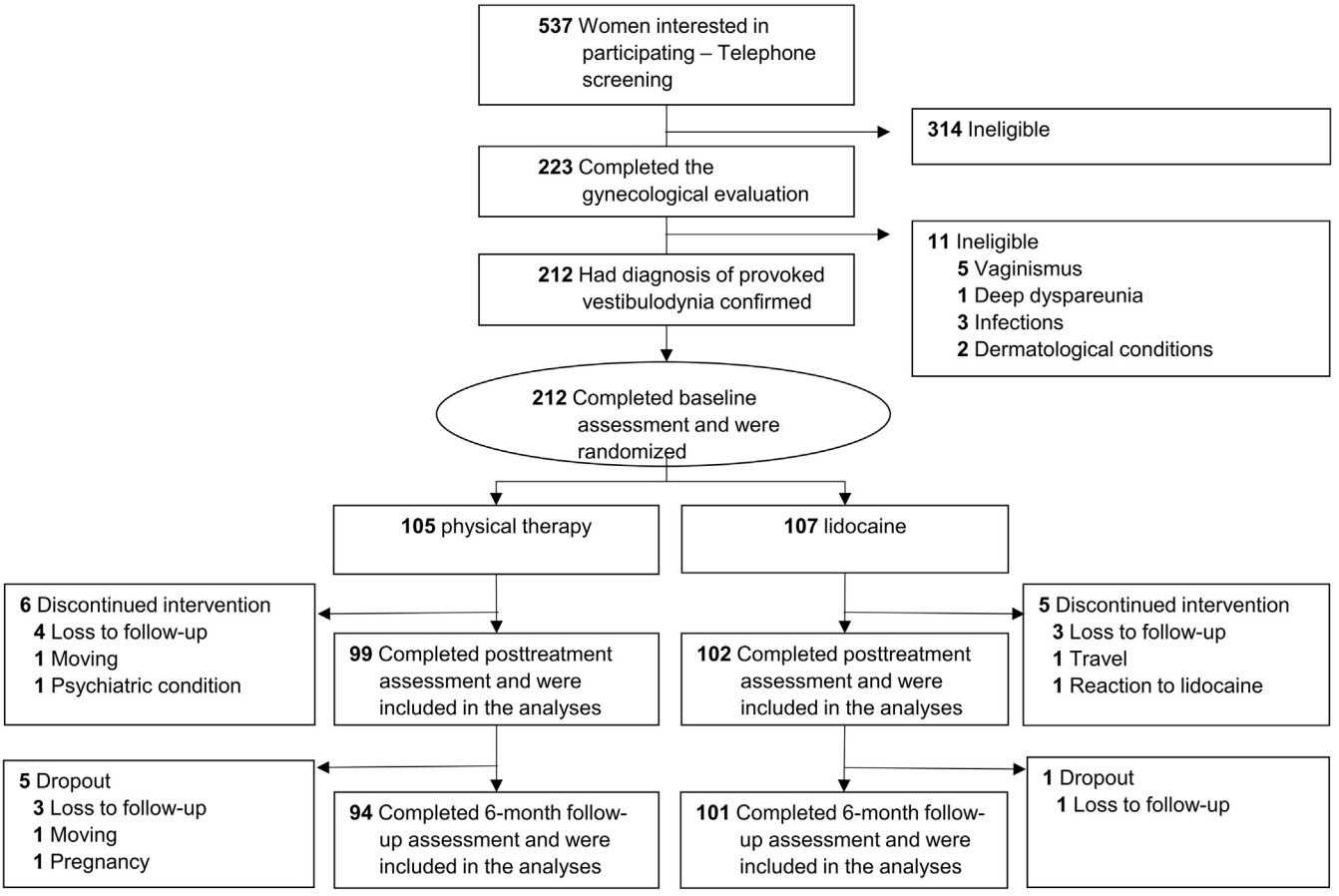
Participants

Of the 537 women interested in participating, 212 were found eligible and randomized to either physical therapy (105) or lidocaine (107) (Figure 1). Baseline characteristics were similar between the 2 groups (Table 1). Moreover, there were no significant differences in baseline characteristics and outcomes between women who completed the trial and those who did not.

Primary outcome

Mean estimated pain intensity during intercourse over time derived from the multilevel model is presented in Figure 2, A. Pain was reduced for women in both the physical therapy and the lidocaine groups from baseline to posttreatment as revealed by statistically significant within-group slopes (both, $P<.001$). However, physical therapy was found to be more effective than lidocaine for reducing pain according to the between-group slope difference ($P<.001$) and mean estimated difference between groups at posttreatment (1.8; 95% CI, 1.2−2.3; $P<.001$) (Table 2). Results were maintained at 6-month follow-up as indicated by nonsignificant changes from posttreatment to follow-up (within-group slope for physical therapy, $P=.25$; for lidocaine, $P=.11$). Therefore, physical therapy remained more effective than lidocaine

FIGURE 1
CONSORT diagram



CONSORT, Consolidated Standards of Reporting Trials.

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for reducing pain intensity at 6-month follow-up (mean estimated pain difference between treatments, 1.8; 95% CI, 1.2−2.5; $P<.001$) (Table 2).

Secondary outcomes

Mean estimated scores derived from the multilevel model for pain quality, sexual function, and distress over time according to treatment group are illustrated in Figure 2, B−D. Mean estimated differences between groups are presented in Table 2. Women in both groups had positive impacts for all outcomes from baseline to posttreatment, as revealed by statistically significant within-group slopes (all, $P<.001$). However, physical therapy was more effective than lidocaine for pain quality, sexual function, distress according to the difference in group slopes (all, $P<.001$) and mean estimated difference between groups at posttreatment (all, $P<.001$). For all outcomes, benefits were maintained at 6 months as indicated by nonsignificant changes from posttreatment to follow-up. Therefore, physical therapy remained more effective than lidocaine at 6-month follow-up for all secondary outcomes (all between-group scores, $P<.001$).

As for treatment satisfaction (Table 2), women in the physical therapy group also reported higher satisfaction with treatment than women in the lidocaine group at posttreatment and 6-month follow-up ($P<.001$). As measured by the PGIC at posttreatment, 79% of women in the physical therapy group reported being very much or much improved compared with 39% in the lidocaine group ($P<.001$).

Clinically important changes and meaningful outcomes

Table 3 shows that, considering an MCID of 30% reduction in pain intensity,[21] significantly more participants in the physical therapy group than in the lidocaine group showed improvement: 91% vs 62% at posttreatment and 89% vs 55% at follow-up ($P<.001$ derived from chi-square tests). Moreover, significantly more women in the physical therapy group presented no or only mild pain intensity ($P<.001$). The physical therapy group also met the standards for clinically meaningful improvement in the MPQ significantly more often than did the lidocaine group (Table 3). Higher percentages of women in the physical therapy group were no longer considered at risk of sexual dysfunction or sexual distress according to the clinical cutoff

TABLE 1
Characteristics of the participants at baseline according to treatment group

Characteristic	Physical therapy (n=105)	Lidocaine (n=107)
Age, y	22 (21–26)	22 (21–25)
<20	13 (12)	10 (9)
20–25	64 (61)	74 (69)
26–30	21 (20)	17 (16)
31–35	6 (6)	5 (5)
>35	1 (1)	1 (1)
BMI, kg/m^2	22 (20–24)	22 (20–24)
Place of birth		
North America	93 (89)	96 (90)
Europe	3 (3)	4 (4)
Latin/South America	1 (1)	5 (4)
Other	8 (7)	2 (2)
Income, Canadian $		
0–9999	35 (33)	41 (38)
10,000–19,999	33 (32)	30 (28)
20,000–39,999	21 (20)	17 (16)
≥40,000–59,999	16 (15)	19 (18)
Education		
High school	22 (21)	19 (18)
College	44 (42)	51 (48)
University—graduate	39 (37)	36 (34)
Relationship status		
Married	7 (7)	8 (7)
Civil union (living with a partner for ≥2 y)	33 (31)	31 (29)
In relationship	65 (62)	68 (64)
Relationship duration, y	2.7 (1.1–4.1)	2.2 (1.1–4.0)
Pain intensity during intercourse (NRS, 0–10)	7.5 (6.0–8.0)	7.0 (6.0–8.0)
Moderate (5–6)	35 (33)	29 (27)
Severe (7–10)	70 (67)	78 (73)
Duration of pain, y	3.0 (1.6–6.0)	2.5 (1.5–5.5)
≥0.5–1	19 (18)	15 (14)
>1–5	53 (51)	63 (59)
>5	33 (31)	29 (27)
Type of PVD		
Primary (pain since the first sexual intercourse)	42 (40)	33 (31)
Secondary (pain acquired after a period of pain-free sexual intercourse)	63 (60)	74 (69)
Frequency of intercourse (per mo)	3.5 (1.0–8.0)	4.0 (1.0–8.0)
Use of hormonal contraceptive	85 (81)	85 (79)

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TABLE 1
Characteristics of the participants at baseline according to treatment group *(continued)*

Characteristic	Physical therapy (n=105)	Lidocaine (n=107)
Previous treatment attempted		
Lidocaine previous intercourse	14 (13)	14 (13)
Psychotherapy	6 (6)	5 (5)
Topical estrogen	6 (6)	8 (7)
Antidepressant	2 (2)	0 (0)
Natural product	3 (3)	4 (4)

Data are expressed as median (interquartile range) or number (percentage).

NRS, numeric rating scale; *PVD*, provoked vestibulodynia.

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scores (Table 3). In addition to supporting clinically meaningful outcomes, the NNT obtained for all outcomes were very low, ranging between 2.9 and 5.6, which indicates that only a small number of patients are needed to obtain significant benefit in comparison with lidocaine.

Treatment adherence

Regarding adherence to treatment, with the exception of the 6 participants who discontinued the intervention, all other women attended all 10 of their physical therapy sessions. The overall adherence to home exercises had a median of 85% (interquartile range [IQR], 75%−91%). Except for the 5 participants who discontinued the intervention, all other women completed 10 weeks of lidocaine application. The overall adherence for lidocaine had a median of 91% (IQR, 83%−96%). With regard to other treatments while under trial, 2 women in the physical therapy group had psychotherapy, whereas in the lidocaine group, 3 had psychotherapy, 4 physical therapy, and 1 topical corticosteroids. The results of the primary and secondary outcomes remained unchanged when removing these participants from the analyses.

Adverse events

No adverse events were reported by women in the physical therapy group. In the lidocaine group, 1 participant discontinued the study because of a dermatitis reaction to lidocaine, and 15 women (15%) reported a minor irritating or burning sensation.

Discussion

Principal findings

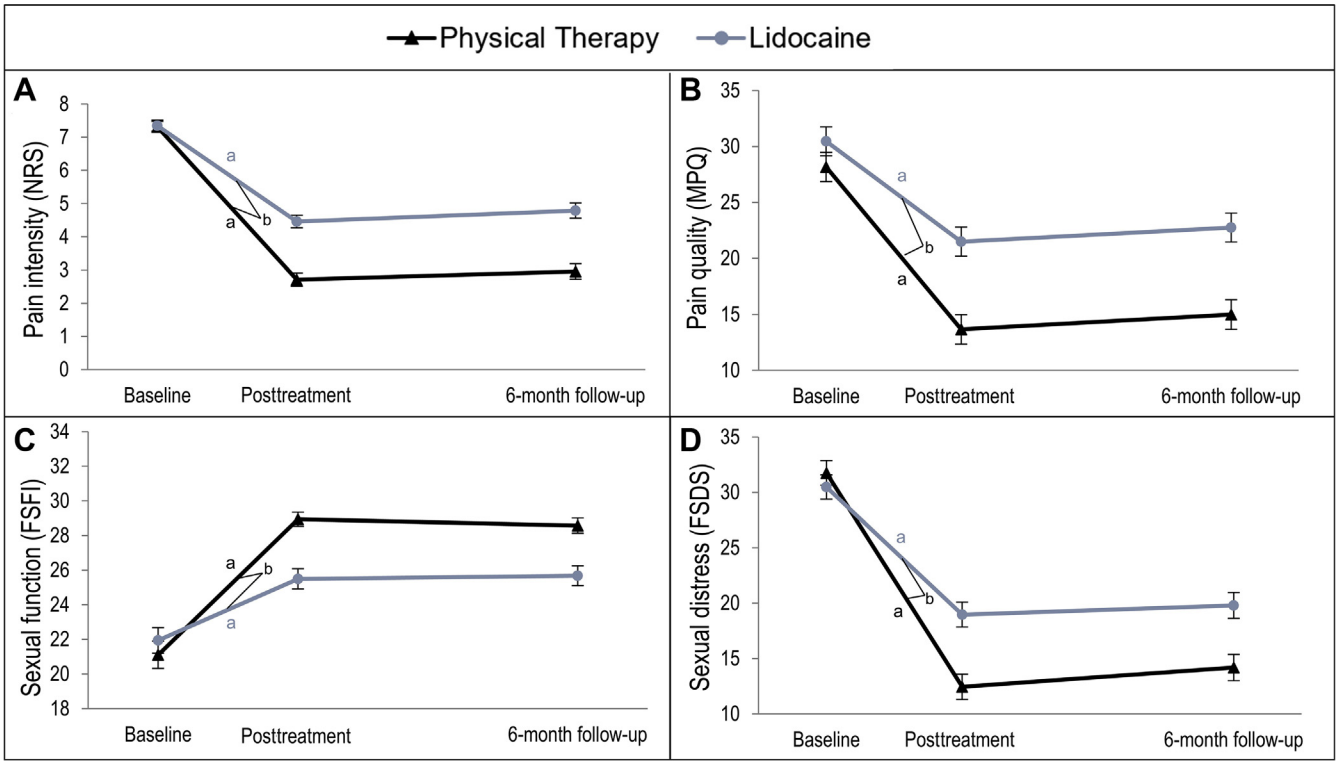
This randomized clinical trial showed that physical therapy is more effective than lidocaine in reducing pain and sexual distress and improving sexual function. The observed benefits in the physical therapy group were sustained at 6-month follow-up and were also clinically significant because they exceeded the specified thresholds for MCID and clinical cutoff for all outcomes.

Results in context

Pain during intercourse significantly declined from baseline to posttreatment and results were sustained at 6-month follow-up, suggesting that both treatments were successful in alleviating pain. However, physical therapy proved to be significantly more effective. This result is consistent with those of previous small nonrandomized or pilot studies suggesting significant reduction in pain after physical therapy.[14−16] In a retrospective study by Hartmann and Nelson[16] (n=24) and a prospective uncontrolled study by Goldfinger et al[14] (n=13), the extent of changes observed seemed comparable with the effect demonstrated in our trial with baseline pain at 7 to 8 of 10 and posttreatment pain at 2 to 3 of 10. Another pilot study by Goldfinger et al[15] also reported significant changes in pain intensity after physical therapy but failed to detect any significant difference with cognitive behavioral therapy. This could be explained by their lack of statistical power because they included only 10 women per group. Interestingly, in our study, the benefits of physical therapy were not only statistically significant but also clinically relevant given that 91% and 89% met the standards for clinically meaningful reduction in pain[21] at posttreatment and follow-up, respectively (compared with 52% and 46% for lidocaine). These findings are in line with those of Goldfinger et al[15] reporting that 90% of participants had reached the clinically significant change in pain after physical therapy. It is also worth noting that most women in our trial had no or only mild pain[23] after physical therapy. In addition to pain intensity, we also showed that pain quality (MPQ), taking into account affective, sensory, and evaluative components, was reduced after physical therapy and at follow-up compared with lidocaine. This contrasts with the pilot study by Goldfinger et al[15] indicating changes in only 1 component of the MPQ at posttreatment, which were not sustained at the 6-month follow-up. The greater benefits observed in our study may be explained by a higher number of physical therapy sessions, an exercise program designed according to the latest evidence on pelvic floor alterations in women with vestibulodynia,[33] and a more thorough educational program focusing on chronic pain management.

Sexual dysfunction, along with pain during intercourse, is the main complaint of women with PVD.[5] Significant improvements in sexual function and sexual distress were observed in both groups, but

FIGURE 2
Pain intensity, pain quality, sexual function, and sexual distress over time according to treatment groups



Mean estimated values over time according to treatment group. The mean pain intensity is measured on an NRS (scores range from 0 to 10, with 0 indicating no pain and 10 the worst possible pain). **A,** The mean pain quality is evaluated with the MPQ ranging from 0 to 78, with higher values indicating worst pain. **B,** Sexual function as assessed with the FSFI (range, 19—110; higher values being related to better sexual functioning). **C,** Sexually related distress is evaluated with the FSDS (range, 0—52; higher values being related to more distress). **D,** Mean values, standard error, and *P* values are derived from the multilevel model of change. I bars indicate standard error. The letter "a" denotes significant within-group slope, $P<.01$, and the letter "b" represents between-group significant difference (difference in treatment slopes), $P<.001$.

FSDS, Female Sexual Distress Scale; *FSFI*, Female Sexual Function Index, *MPQ*, McGill-Melzack Pain Questionnaire; *NRS*, numeric rating scale.

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physical therapy was found to be more effective than lidocaine and the results were sustained at the 6-month follow-up. A higher percentage of women were no longer within clinical ranges of sexual dysfunction and distress after physical therapy. These results concur with those of uncontrolled studies suggesting improvement in sexual function after physical therapy.[14,16] Overall, our findings emphasize the importance of making sexual dysfunction an intervention target that includes a comprehensive psychosexual educational program combined with the use of dilators to help women achieve pain-free sexual intercourse.

In terms of participant perceived improvements, women in the physical therapy group were more satisfied and perceived more improvement: 79% of women reported being very much or much improved after treatment compared with 39% in the lidocaine group. This corroborates the results of 2 previous studies reporting that 72% to 77% of women had significant improvement.[13,14]

Clinical and research implications

Although the clinical guidelines of leading societies concur to recommend physical therapy as a first-line intervention for PVD,[34,35] access to treatment remains limited and arduous.[2,6,36] Our findings provide strong evidence that physical therapy is effective in women with PVD with statistically significant and clinically meaningful benefits sustained at 6-month follow-up. We hope these results will encourage decision makers, administrative stakeholders, insurance companies, and clinicians to promote and facilitate access to physical therapy treatments. Further studies are needed to investigate the implementation of physical therapy treatment including facilitators and barriers to treatment access and coverage.

Strengths and limitations

The main strengths of this trial were the use of a randomized design, sufficiently powered intent-to-treat analyses, rigorous eligibility criteria with precise diagnosis of PVD, long-term follow-up,

TABLE 2
Study measures at baseline, posttreatment, and 6-month follow-up and differences between treatment groups

Study measure	Physical therapy (n=105)	Lidocaine (n=107)	Mean difference between treatment groups (95% CI)	*P* value
Pain intensity (NRS)				
Baseline	7.3 (0.2)	7.3 (0.2)	0.0 (−0.4 to 0.5)	.88
Posttreatment	2.7 (0.2)	4.5 (0.2)	1.8 (1.2−2.3)	<.001
6-mo follow-up	3.0 (0.2)	4.8 (0.2)	1.8 (1.2−2.5)	<.001
Pain quality (MPQ)				
Baseline	28.2 (1.3)	30.5 (1.3)	2.3 (−1.3 to 5.9)	.20
Posttreatment	13.7 (1.3)	21.5 (1.3)	7.8 (4.200−11.4)	<.001
6-mo follow-up	15.0 (1.3)	22.8 (1.3)	7.8 (4.2−11.4)	<.001
Sexual function (FSFI)				
Baseline	20.1 (0.8)	20.7 (0.6)	0.5 (−1.2 to 2.2)	.55
Posttreatment	28.0 (0.6)	23.5 (0.6)	−4.4 (−6.1 to −2.7)	<.001
6-mo follow-up	27.3 (0.6)	24.0 (0.6)	−3.3 (−5.0 to −1.6)	<.001
Sexually related distress (FSDS)				
Baseline	31.8 (1.1)	30.5 (1.1)	−1.3 (−4.3 to 1.8)	.41
Posttreatment	12.4 (1.1)	19.0 (1.1)	6.5 (3.4−9.7)	<.001
6-mo follow-up	14.2 (1.2)	19.8 (1.2)	5.6 (2.4−8.8)	<.001
Satisfaction (NRS, 0−10)				
Posttreatment	8.9 (0.1)	5.6 (0.3)	3.3 (2.7−4.0)	<.001
6-mo follow-up	8.5 (0.2)	5.2 (0.3)	3.2 (2.6−4.0)	<.001
Participants' perceived improvement (PGIC)[a], n (%)				
Very much improved	43 (43)	14 (14)	—	<.001
Much improved	35 (35)	26 (25)	—	
Minimally improved	20 (20)	31 (30)	—	
No change	1 (1)	29 (28)	—	
Minimally worse	0 (0)	0 (0)	—	
Much worse	0 (0)	2 (2)	—	
Very much worse	0 (0)	0 (0)	—	

Data shown are the mean estimated scores and standard error derived from multilevel model according to treatments and mean difference between treatments (95% CI). Numbers (and percentages) of participants are presented for perceived improvement. *P* values denote between-group differences.

CI, confidence interval; *FSDS*, Female Sexual Distress Scale; *FSFI*, Female Sexual Function Index; *MPQ*, McGill-Melzack Pain Questionnaire; *NRS*, numeric rating scale; *PGIC*, Patient Global Impression of Change.

[a] Only posttreatment data are presented because the 6-month assessment was misconceptualized by some participants who reported changes from posttreatment to 6-month follow-up instead of the overall effect from baseline to 6-month follow-up.

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and physical therapy treatment being relevant to current practice. The selection of outcomes complies with current guidelines from leading consensus groups[21,22] recommending patient-reported outcomes to capture the multidimensional experience of pain and sexual dysfunctions. Furthermore, participants' adherence to the trial procedures and the intervention was high. This could be explained by the multimodal, intensive, and supervised treatment proposed, which has been suggested to favor adherence.[19,37] We also offered a flexible schedule for the participants and employed experienced physical therapists. As for the limitations, this study did not include a placebo arm, given that validated and credible sham physical therapy has never been investigated. In this context, the Consolidated Standards of Reporting Trials (CONSORT) extension for behavioral treatment advocates for the use of an active comparator reflecting current practice.[38] Thus, topical lidocaine was selected because it corresponds

TABLE 3
Participants with clinically important changes and clinically meaningful outcomes

Study measure	Physical therapy	Lidocaine	*P* value	NNT (95% CI)
Distribution of participant with clinically important changes				
Pain intensity (NRS)[a]				
30% reduction on NRS at posttreatment	90 (91)	63 (62)	<.001	3.4 (2.5–5.5)
30% reduction of NRS at 6-mo follow-up	84 (89)	56 (55)	<.001	2.9 (2.2–4.5)
Pain quality (MPQ)[b]				
30% reduction on MPQ at posttreatment	69 (71)	53 (52)	.006	5.6 (3.2–22.4)
30% reduction on MPQ at 6-mo follow-up	62 (67)	45 (46)	.004	4.7 (2.8–12.9)
Distribution of participant with clinically meaningful outcomes (based on clinical cutoff)				
Pain intensity (NRS)[c]				
Posttreatment				
None to mild (0–4)	84 (85)	52 (51)	<.001	2.9 (2.2–4.6)[d]
Moderate (5–6)	11 (11)	27 (26)		
Severe (7–10)	4 (4)	23 (23)		
6-mo follow-up				
None to mild (0–4)	73 (78)	48 (48)	<.001	3.3 (2.3–5.8)[f]
Moderate (5–6)	17 (18)	27 (27)		
Severe (7–10)	4 (4)	26 (26)		
Sexual function (FSFI)[e]				
Sexually functional (≥26.55) at posttreatment	65 (66)	44 (43)	.001	4.4 (2.8–10.9)
Sexually functional (≥26.55) at 6-mo follow-up	59 (63)	39 (39)	.001	4.1 (2.6–9.5)
Sexually related distress (FSDS)[f]				
No sexually distress (<15) at posttreatment	65 (66)	48 (47)	.008	5.8 (3.1–19.5)
No sexually distress (<15) at 6-mo follow-up	56 (60)	36 (37)	.002	4.2 (2.7–9.7)

Values are expressed as number (percentage) unless indicated otherwise.

Distribution of participants presenting clinically important changes or clinically meaningful outcomes (derived from clinical cutoff score) is presented in agreement with the available literature. *P* values were calculated with the use of the chi-square tests.

CI, confidence interval; *FSDS*, Female Sexual Distress Scale; *FSFI*, Female Sexual Function Index; *MPQ*, McGill-Melzack Pain Questionnaire; *NNT*, number needed to treat; *NRS*, numeric rating scale.

[a] MCID corresponds to a reduction of 30% in pain intensity evaluated with the NRS[21]; [b] MCID corresponds to a reduction of 30% on the MPQ[31]; [c] Pain intensity rating categories of mild, moderate, and severe were set according to previous research on disabilities[23]; [d] NNT calculated for none to mild pain; [e] Clinically meaningful findings for the FSFI were evaluated with the cutoff score of ≥26.55 indicating low risk of sexual dysfunction[32]; [f] A score of <15 on the FSDS is the clinical cutoff for low risk of sexual distress[26].

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to the common usual care for PVD, and therefore, we intentionally limited the number of contacts with the health professional to weekly phone calls to reliably represent treatment delivery in clinical settings. Moreover, as highlighted in the CONSORT extension,[38] blinding of participants is nearly impossible to achieve with these types of interventions. Therefore, it is recommended to minimize bias, which we aimed to achieve by using assessors not involved in the treatment and blinded to group assignation. It should also be pointed out that the risk of bias is likely low given that similar studies failed to demonstrate the superiority of active treatments (biofeedback[19] and antidepressant[9]) in comparison with lidocaine. Furthermore, nulliparous women aged 18 to 45 years were targeted in this study. This age group was shown to be generalizable to the population of women with PVD given that it covers 87% of affected women.[2] Most importantly, it allowed to control for factors confounding the PVD diagnosis such as childbirth-related lesions and genitourinary syndrome of menopause. Likewise, women with other types of chronic vulvar pain (eg, deep dyspareunia, unprovoked pain, dermatologic conditions) were excluded to investigate treatments designed to specifically address PVD. The inclusion of these other types of pain would have required adapting our treatment protocol and would probably have introduced a bias favoring physical therapy treatment because topical lidocaine is not likely to have a significant effect for these conditions. Furthermore, multiple physical therapy modalities were selected

for the adequate portrayal of current clinical practice.[11] This contributes to the external validity of our study but prevents us from discussing the isolated contribution of each modality. Given the complexity of vulvar pain conditions, it is unlikely that a single modality could address the multidimensionality of pain. Indeed, the efficacy of our multimodal treatment seems to largely outweigh that of single isolated modalities.[17]

Conclusion

Our findings confirm that physical therapy is effective for reducing pain and sexual distress and for improving sexual function. Thus, they provide strong evidence for recommending physical therapy as the preferred first-line treatment for PVD. ■

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Appendix

Physiotherapy treatment protocol

The physiotherapy treatment consisted of 10 weeks of individual 1-hour sessions. The modalities composing the physical therapy treatment were selected to reflect current clinical practice.[1] A total of 15 physical therapists provided treatments in the study. They were all certified physical therapists with postgraduate qualifications in women's health and had all received a standardized training for the treatment protocol. Their adherence to the protocol was monitored by the principal investigator with a regular review of each patient's chart.

Education

The educational component of our intervention included various topics such as vulvodynia pathophysiology, the involvement of pelvic floor muscles and treatment mechanisms of action, healthy vulvovaginal behaviors (hygiene, lubricant, avoidance of irritants), chronic pain management (including factors influencing pain), urogynecologic health (eg, differences between infection and normal secretion, frequency of urination, constipation, liquid ingestion), relaxation techniques and breathing techniques, and sexual functioning (eg, physiology of desire, excitation and orgasm, promotion of nonpainful sexual activities, and steps toward resuming intercourse). Moreover, partners were convened to attend 1 session to discuss the main educational topics and learn how they could assist their female partner in treatment.

Manual therapy techniques

Approximately 20 to 25 minutes were dedicated to manual techniques in each session. It should be underlined that these techniques were adapted to each woman and were progressed throughout the treatment sessions (eg, from 1 to 2 fingers, more pressure or stretching applied). Stretching, myofascial release techniques, pressure, massage, and neuromuscular reeducation were applied externally and intravaginally to the pelvic floor muscles to increase flexibility and release muscle tensions and trigger points. Similar techniques were also applied to the hip and abdominal muscles, depending on each patient's pain referral pattern. Moreover, conjunctive tissue manipulations were applied to the vulvar, hip, and abdominal areas when they reproduced the patient's symptomatology. Vestibule massage and desensitization were implemented in the seventh session.

Pelvic floor muscle biofeedback

A 20-minute period of biofeedback (Evadri, Hollister, Biomation, Canada) was undertaken using a small intravaginal probe to promote pelvic floor muscle relaxation, control and strength, speed of contraction, and endurance. The training first entailed a relaxation period while monitoring resting electromyography (ie, 2 sets×30 seconds). Thereafter, women had to perform the following exercises under the guidance of the physiotherapist: maximal voluntary contraction (MVC) (2 sets of 10 repetitions, 6 seconds contraction, 12 seconds rest. This duration was increased to 10 seconds contraction with 20 seconds rest throughout sessions), podium contraction (MVC/50% MVC/MVC; 3 repetitions; 6−10 seconds each intensity) or reversed podium (50% MVC/MVC/50% MVC), rapid contractions for 20 seconds, and endurance (60 seconds of sustained contraction). The physiotherapist monitored and emphasized the importance of the adequate relaxation of the pelvic floor muscles throughout the session. The relaxation exercise was repeated at the end of this segment. These pain-free exercises were proposed according to the latest evidence on pelvic floor alterations in women with vestibulodynia.[2,3]

Home exercise program

The home exercise program incorporated deep breathing exercises and pelvic floor contractions using the same progression as in treatment for 5 days per week. Women were also instructed to perform insertion techniques using a finger and then a dilator 3 days per week (ie, various sizes were used depending on each woman. The size was increased following each woman's progression). Women were also taught to apply additional stretching using neuromuscular techniques (hold-relax techniques) at various vaginal sites (3-, 4:30-, 6-, 7:30-, and 9-o'clock positions) for approximately 5 minutes. Oscillation movements were also applied (ie, 10 gentle inward and outward movements of the dilator while maintaining the pain at a minimal intensity, 10 repetitions). Vestibule massage and desensitization were added in session 7 and stretching of the piriformis, the adductors, and the gluteal muscles in session 8, whenever relevant.

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