The Treatment of Provoked Vestibulodynia
A Critical Review

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Objective: To carry out a critical review of published studies concerning the treatment of provoked vestibulodynia.

Methods: MEDLINE, PsycINFO, and Cochrane were used to identify treatment studies published between January 1996 and December 2006. All studies published in English that dealt specifically with the treatment of provoked vestibulodynia were included in the review regardless of their methodological quality. Thirty-eight treatment studies were thus examined in the present paper.

Results: Since 1996, surgical treatment has received somewhat less empirical attention. Nevertheless, it still boasts the best success rates, which range from 61% to 94%. More studies have focused on medical treatments, yielding success rates varying between 13% and 67%. Behavioral treatments have been the least studied, although 35% to 83% of patients benefit from them. Despite these interesting results, only 5 of the 38 treatment studies reviewed are randomized clinical trials. Furthermore, the majority of studies have several methodological weaknesses, such as the absence of (1) control or placebo group, (2) double-blind evaluation, (3) pretreatment pain evaluation, and (4) validated measures of pain and sexual functioning.

Discussion: On the basis of the results of the reviewed prospective studies and the randomized clinical trials, vestibulectomy is the most efficacious treatment to date. Though some medical treatments seem little effective, others appear promising and should be investigated further, as is the case with behavioral treatments. Additional randomized clinical trials are necessary to confirm the efficacy of surgery and validate nonsurgical treatments for provoked vestibulodynia.

Key Words: vestibulodynia, dyspareunia, vulvodynia, treatment, urogenital pain

(*Clin J Pain* 2008;24:155–171)

Received for publication June 11, 2007; revised August 23, 2007; accepted September 8, 2007.

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Supported by a Fonds Québécois de la Recherche sur la Société et la Culture fellowship to Tina Landry and by a Canadian Institutes of Health Research grant to Sophie Bergeron.

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Described over a century ago,[1] provoked vestibulodynia is recognized as the most frequent cause of dyspareunia in premenopausal women.[2,3] Recent epidemiologic data suggest that vestibulodynia affects 12% of the general population,[4] and another study reported a 15% prevalence rate in gynecologic clinics.[3] Further, urogenital pain has serious repercussions on many aspects of daily functioning, namely sexual function, dyadic adjustment, psychologic well-being, and quality of life.[5–7] According to Friedrich,[2] provoked vestibulodynia is characterized by (1) severe pain upon vestibular touch or attempted vaginal entry, (2) acute pain during cotton swab palpation of the vestibular area, and (3) vestibular erythema. The reliability of the third criterion has however been disconfirmed by 2 recent studies.[8,9]

Despite the significant prevalence and negative impact of vestibulodynia, progress concerning the study of its treatment has been slow. Although a wide variety of surgical, medical, behavioral, cognitive-behavioral, and alternative treatments have been proposed and some treatment guidelines have been issued,[10–13] no consensus exists concerning the standard algorithm to follow. This absence of consensus can be explained in part by a lack of knowledge concerning the etiology of vestibulodynia, hence the trial and error treatment process. Nevertheless, the proposed treatment guidelines are devoid of a scientific basis mostly because until recently, there was a paucity of rigorous studies focusing on the evaluation of available interventions. Indeed, in a critical review published in 1997, Bergeron et al[14] concluded that treatment efforts were largely based on uncontrolled clinical observations given the absence of prospective randomized clinical trials.

There has been a substantial increase in the number of studies relating to provoked vestibulodynia, particularly in the treatment domain since 1997. However, there has not been a comprehensive review of the literature synthesizing the therapeutic knowledge accumulated over the past 10 years. The goal of the present article is to critically review vestibulodynia treatment studies published since 1997,[14] with an emphasis on pain and sexual function outcomes.

MATERIALS AND METHODS

MEDLINE, PsycINFO, and Cochrane databases were searched for empirical studies pertaining to the

treatment of provoked vestibulodynia. Given that the review of Bergeron et al[14] covered studies published until 1995, the present search encompassed articles published in English between January 1996 and December 2006. The following keywords were used in MEDLINE and PsycINFO: («vulvar vestibulitis» or «vestibulodynia» or «vulvar dysesthesia» or «dyspareunia» or «sexual pain disorders» or «genital pain syndromes») and («treatment» or «management»). As for the Cochrane database, the keywords «vulvar vestibulitis» and «vestibulodynia» were used by selecting the tab «search all text». The reference lists of the identified treatment studies and reviews were also examined to target all other relevant literature.

Overall, the search strategy identified 962 potential articles concerning genital pain, of which 789 articles in MEDLINE, 163 in PsycInfo, and 10 in Cochrane. However, the PsycINFO and Cochrane searches identified the same treatment studies as the MEDLINE search. After having viewed the title, abstract, reference list, and, if necessary, the full article, all studies specifically concerning the treatment of provoked vestibulodynia were included in the review. Thus, studies were not excluded on the basis of the research design, sample size, or any other factor concerning methodological quality. Consequently, a total of 38 treatment studies were included. It is to be noted that some studies may have compared 2 or more therapeutic modalities and therefore appear in more than one section of this article.

RESULTS

Treatments for provoked vestibulodynia can be divided into 4 distinct categories: surgical, medical, behavioral/cognitive-behavioral, and alternative treatments. The 14 surgical treatment studies are described in Table 1, whereas the 14 medical treatment studies are presented in Table 2. Finally, the 6 behavioral/cognitive-behavioral treatment studies and the 5 alternative treatment studies appear in Table 3. The studies are presented in the tables in the order of appearance in the text.

Surgical Treatment

In their 1997 review, Bergeron et al[14] concluded that the main surgical treatment, vestibulectomy, was the intervention that was the most frequently studied and that achieved the best success rates. Though having received less empirical attention since 1997, surgery has been the object of studies of higher methodological quality in the past decade (Table 1).

Vestibulectomy, often referred to as modified perineoplasty, typically consists of the excision of the posterior hymen and of the painful mucosa of the posterior and anterior vestibule to a depth of about 2 to 5 mm. If necessary, the vaginal mucosa is mobilized, brought downward to cover the excised region, and held in place with sutures.[2,24,52] Vestibulectomy is generally recommended after the failure of less invasive medical treatments.[14] Two other types of surgical treatments also exist: Woodruff and Parmley's[53] original perineoplasty (less used today and consisting of elongating the excision down to the perineum) and modified vestibulectomy (limits the excision to the posterior fourchette of the vestibular area).[20]

Among the 14 studies focusing on the surgical treatment of provoked vestibulodynia, 6 are retrospective. First, Chaim et al[15] showed that 94% of women reported an overall improvement of their dyspareunia after modified perineoplasty. Gaunt et al[16] found a similar success rate, with 90% of participants having significant relief of their pain. Bergeron et al's[5] study showed that 63% of women experienced a significant pain reduction and that sexual functioning significantly improved. However, 1 woman asserted that her pain worsened after vestibulectomy, and 2 women for whom the surgery had initially been effective indicated a return of their pain. Traas et al's[17] retrospective study included a larger number of participants, 62% of whom reported having no more pain and 73% who claimed to be satisfied with their sex life after vestibulectomy. However, 39% of the women mentioned having had long-term complications since the surgery, the most frequent complication being decreased lubrification. In a similar study conducted by Goldstein et al,[18] 77% of participants reported having either no more pain or a negligible discomfort and 87% affirmed having a better sex life. Last, McCormack and Spence[19] obtained comparable results using the original perineoplasty, with 80% of participants reporting an improvement of their dyspareunia.

The 6 prospective studies showed similar results to those generated via retrospective designs. First, in Goetsch' study,[20] 83% of women had complete relief of their pain after regular or modified vestibulectomy. However, 42% declared suffering from vaginismus after the surgery, which was resolved with the assistance of their partner or with desensitization therapy. Using a larger sample, Bornstein et al[21] found that 76% of participants reported a complete relief of their pain. Likewise, 83% of Schneider et al's[22] participants reported a moderate to excellent improvement of dyspareunia. However, minor postsurgery complications were noted by 15% of women (eg, severe pruritus, heavy bleeding, local infection, Bartholin duct stenosis) and a second surgery was required for 17% of participants. In the only study including a no-treatment control group, Granot et al's[23] participants chose either to have a vestibulectomy, one of 3 nonsurgical treatments (ie, biofeedback, cognitive-behavioral therapy, or use of hypoallergic agents), or no treatment. Results showed that 79% of participants who underwent vestibulectomy experienced a significant reduction of vulvar pain, whereas this success rate was 48% for those who received nonsurgical treatments and 12% for the no-treatment group. Despite these interesting results, participants in the nonsurgical treatment group did not all receive the same treatment, which makes it impossible to distinguish the success attributable to each intervention. Finally, 2 modified vestibulectomy studies showed similar results to other prospectively investigated

TABLE 1. Surgical Treatment Studies

References	Sample Characteristics (N, age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
Chaim et al[15]	N 16; age 20-36	Modified perineoplasty	Retrospective study	Friedrich's criteria	Vulvar burning, failure of more conservative treatments after a 6-mo period	Self-reported dyspareunia after surgery (no improvement/relief or reduction)	6 mo-7 y ($\bar{X}$ = 3.5 y)	15/16 overall improvement; 1/16 no improvement	1, 2, 3, 4, 6
Gaunt et al[16]	N 45 (but 3 lost at follow-up); age 29 (median)	Vestibulectomy	Retrospective study	Friedrich's criteria	Pathologic diagnosis of chronic inflammation, no pelvic floor tension myalgia, no nonspecific vulvodynia, no condyloma or signs of HPV	Pain score before/after surgery based on subjective symptom description by participant and objective findings from physician	1-236 mo ($\bar{X}$ = 33 mo)	38/42 total or significant relief; 4/42 no improvement or deterioration	1, 2, 4, 5
Bergeron et al[5]	N 38; age 19-52	Vestibulectomy	Retrospective study	Friedrich's criteria	Moderate to severe interference with intercourse, no active infections, failure of more conservative medical treatments, experience of vestibulodynia symptoms $\geq$ 6 mo	Self-reported dyspareunia before/after surgery (scale from 1 «no improvement» to 5 «complete relief»); self-reported sexual functioning before/after surgery	1.1-10 y ($\bar{X}$ = 3.3 y)	14/38 complete relief; 10/38 great improvement; 5/38 moderate improvement; 3/38 little improvement; 6/38 no improvement	1, 2, 3, 6
Traas et al[17]	N 126; age 18-39	Vestimulectomy	Retrospective study	Friedrich's criteria	Women of less than 40 y of age at the time of surgery, no previous surgery for vestibulodynia	Self-reported dyspareunia, sexual intercourse possible, satisfactory sexual life, and positive recommendation after surgery («yes» or «no»)	13-57 mo ($\bar{X}$ = 37 mo)	Dyspareunia: 50/126 yes; 76/126 no Sexual intercourse possible: 113/126 yes; 13/126 no	1, 2, 3, 4, 6
Goldstein et al[18]	N 104; age not specified	Vestimulectomy	Retrospective study	Pain limited to the vulvar vestibule	No pelvic floor hypertonicity, at least 2 discussions about available conservative treatment options before consenting to surgery	Self-reported dyspareunia after surgery (qualitative scale from «no pain» to «apareunia»); self-reported quality of sex life after surgery (qualitative scale from «worse» to «much better»)	1-6 y ($\bar{X}$ = 26 mo)	Dyspareunia: 54/104 no pain; 26/104 discomfort that does not interfere with sex; 12/104 discomfort that does interfere with sex; 12/104 apareunia	1, 2, 3, 4, 5
McCormack and Spence[19]	N 42; age 24-68	Perineoplasty	Retrospective study	Friedrich's criteria	Failure of more conservative treatments, no active infections	Self-reported vulvar discomfort before/after surgery (qualitative scale from «worse» to «discomfort is gone»); self-reported	1-10 y ($\bar{X}$ = 4.8 y)	Vulvar discomfort: 8/42 complete relief; 19/42 much better; 3/42 a little better; 3/42 the same; 1/42 worse; 8/42 never had	1, 2, 3, 4, 5, 6

(*continued*)

TABLE 1. (*continued*)

References	Sample Characteristics (N, age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
						dyspareunia before/after surgery (qualitative scale from «worse» to «pain-free»)		discomfort before surgery Dyspareunia: 13/42 complete relief; 15/42 much better; 3/42 a little better; 1/42 the same; 1/42 worse; 9/42 not applicable	
Goetsch[20]	N 12; age 22-35	Vestibulectomy and modified vestibulectomy	Prospective study	Friedrich's criteria	Westrom criteria, pain relief from application of topical lidocaine 4%	Self-reported dyspareunia after surgery (partial relief/complete relief); changes in tenderness on swab-touch testing	6 mo-6 y ($\bar{X}$ = 3 y)	10/12 complete relief; 2/12 partial relief	1, 2, 3, 4, 6
Bornstein et al[21]	N 89 (but 10 excluded due to missing data); age 17-55	Modified perineoplasty	Prospective study	Friedrich's criteria	Unable to have intercourse because of pain	Self-reported dyspareunia after surgery (incomplete response/complete response)	1 y	60/79 complete response; 19/79 incomplete response	1, 2, 3, 4
Schneider et al[22]	N 69 (but 15 lost at follow-up); age 18-33	Vestibulectomy	Prospective study	Superficial dyspareunia, sensitive to cotton-swab touch	—	Self-reported dyspareunia before/after surgery (Marinoff's scale from 0 «no pain» to 3 «unable to have intercourse»)	6 mo	45/54 moderate to excellent improvement; 9/54 slight or no improvement	1, 2, 3, 4, 6
Granot et al[23]	N 94 (but 4 lost at follow-up) (thus 33 vestibulectomy, 31 nonsurgical treatments, 26 no treatment); age 18-36	3 Groups: Vestibulectomy; nonsurgical treatments; no treatment	Prospective study	Pain during intercourse > 6 mo, severe pain during cotton-swab test in more than one location of 6 vestibular sites	Women between the ages of 18-40, no history of vaginal surgery, no other form of vulvodynia, no systemic disease, psychiatric condition, or hormonal disorder requiring regular medication	Self-reported reduction of dyspareunia after treatment (scale from 0% to 100%)	7-8 mo	Vestibulectomy: 26/33 significant improvement; 7/33 no improvement Nonsurgical treatments: 15/31 significant improvement; 16/31 no improvement No treatment: 3/26 significant improvement; 23/26 no improvement	2, 3, 5

Kehoe and Luesley[24]	N 57 (but 3 lost at follow-up); age 18-53	Modified vestibulectomy	Prospective study	Friedrich's criteria	Reduction or resolution of symptoms with application of local anaesthetic cream before intercourse	Self-reported dyspareunia after surgery (nonresponsive/ partial response/ complete response)	2-42 mo ($\bar{X}$ = 12 mo)	33/54 complete response; 15/54 partial response; 6/54 nonresponsive	1, 2, 3, 4
Lavy et al[25]	N 59 (but 6 lost at follow-up); age 19-48	Modified vestibulectomy	Prospective study	Friedrich's criteria	Failure of more conservative treatments	Self-reported dyspareunia after surgery (no response/partial response/complete response)	6 mo-10 y	39/53 complete response; 7/53 partial response; 7/53 nonresponsive	1, 2, 3, 4, 5
Bornstein and Abramovici[26]	N 19 (10 total perineoplasty, 9 subtotal perineoplasty + interferon); age 18-42	2 Groups: Total perineoplasty; subtotal perineoplasty + interferon-α 2b injections (10 1.5 μ injections)	Randomized clinical trial	Friedrich's criteria	Pain severe enough to prevent from having intercourse ≥ 6 mo	Not reported	3 mo; 6 mo; 1 y	Total perineoplasty: 6/9 complete response Subtotal perineoplasty + interferon: 7/10 complete response	3, 5
Bergeron et al[27]	N 87 (29 in each group, but 9 drop outs) (thus 22 vestibulectomy, 28 group therapy, 28 biofeedback); age 18-50	3 Groups: Vestibulectomy; group cognitive-behavioral therapy (12 wk); electromyographic biofeedback (12 wk)	Randomized clinical trial	Dyspareunia > 6 mo, pain limited to intercourse and other activities involving vestibular pressure, moderate to severe pain in one or more locations of the vestibule during cotton-swab test	Women between the ages of 18-50, no pelvic or vulvar pain not clearly linked to intercourse, no ongoing treatment for dyspareunia, no active infections, no vaginismus, no major medical and/ or psychiatric illness, no ongoing pregnancy	Pain (before/after treatment): Pain during cotton-swab test; self-reported dyspareunia (scale from 0 to 10); McGill Pain Questionnaire Sexual function (before/after treatment): Sexual History Form; Sexual Information Scale of the Derogatis Sexual Functioning Inventory; self-reported frequency of intercourse per month, Psychologic adjustment (before/ after treatment): Brief Symptom Inventory	6 mo	Vestibulectomy: 15/22 complete relief or great improvement of pain Cognitive-behavioral therapy: 11/28 complete relief or great improvement of pain Biofeedback: 10/28 complete relief or great improvement of pain	3

HPV indicates human papillomavirus; N, sample size; $\bar{X}$, mean.

*1 = no control/comparison group; 2 = no random assignment; 3 = nonblind treatment evaluation; 4 = no definition of therapeutic success; 5 = little or no information on sample characteristics; 6 = some participants received another form of treatment between surgery and follow-up.

TABLE 2. Medical Treatment Studies

References	Sample Characteristics (N, Age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
Steinberg et al[28]	N 52 (but 5 lost at follow-up); age 20-41	Cream: Capsaicin 0.025% (preceded by lidocaine gel to prevent pain caused by capsaicin application)	Retrospective study	Friedrich's criteria	Failure of more conservative medical treatments	Kaufman's touch test before/after treatment; self-reported dyspareunia before/after treatment (Marinoff's scale from 1 «causes discomfort but able to have intercourse» to 3 «unable to have intercourse»)	At least 6 wk; maximum follow-up not reported	Significant improvement on touch test and on Marinoff's scale (absolute numbers not reported in the article)	1, 2, 3, 4, 5, 7
Murina et al[29]	N 33 (but 1 drop out); age 21-55	Cream: Capsaicin 0.05% (preceded by lidocaine + prilocaine cream to prevent pain caused by capsaicin application)	Prospective study	Friedrich's criteria	—	Self-reported symptoms of irritation and burning before/after treatment (visual analog scale); self-reported dyspareunia before/after treatment (scale from 0 «no pain» to 3 «pain makes intercourse impossible»)	4 wk; 8 wk; 16 wk; 6 mo	19/32 improvement; 13/32 no improvement	1, 2, 3, 4, 5, 6, 7
Zolnoun et al[30]	N 69 (but 8 lost at follow-up); age 24-36	Cream: Lidocaine 5%	Prospective study	Friedrich's criteria	—	Self-reported dyspareunia and discomfort during daily activity before/after treatment (100 mm visual analog scale)	6-8 wk; at least 6 mo	36/61 dyspareunia reduction of at least 50%; 25/61 did not reach this level	1, 2, 3, 4, 7
Morrison et al[31]	N 34; age 17-59	Cream: Ketoconazole 2%	Prospective study	Friedrich's criteria	No imipramine use	Algesiometer measuring pain thresholds before/after treatment	2 mo; 4 mo; 6 mo; 8 mo	8/34 cured; 7/34 improved; 19/34 not improved	1, 2, 3, 4, 6, 7
Nyirjesy et al[32]	N 34 (but 8 deemed non evaluable) (thus 13 treatment group, 13 placebo group); age 24-49	Cream: Cromolyn 4% Placebo group: Placebo cream	Double-blind placebo controlled randomized clinical trial	Friedrich's criteria	Symptoms present $\geq$ 6 mo, exclusion of participants having other causes for symptoms, no other therapy for vestibulodynia for at least a month before enrollment	Self-reported symptoms of irritation, burning, and dyspareunia before/after treatment (scale from 0 «none» to 3 «severe»); vestibular erythema and tenderness evaluated by investigators before/after treatment (scale from 0 «none» to 3 «severe»)	3 mo	Treatment group: 7/13 symptom reduction of at least 50%; 6/13 did not reach this level Placebo group: 5/13 symptom reduction of at least 50%; 8/13 did not reach this level	5, 7 (criteria 1 not pertinent)

Pagano[33]	N 230; age 16-71	Xylocaine 5% cream before penetration and one of 3 types of prescription medication: ketoconazole (200 mg daily) or fluconazole (150 mg weekly); amitriptyline (maximum of 75 mg daily); carbamazepine (100 mg daily)	Prospective quasiexperimental study	Unclear	—	Self-reported dyspareunia before/after treatment (Marinoff's scale from 1 «causes discomfort but able to have intercourse» to 3 «unable to have intercourse»)	1-5 y	Oral antifungal treatment: 40/60 positive response; 20/60 negative response Amitriptyline treatment: 89/148 positive response; 59/148 negative response Carbamazepine treatment: 4/30 positive response; 26/30 negative response	2, 3, 4, 5, 6, 7
Bornstein et al[34]	N 40 (20 treatment group, 20 placebo group); age 18-70	Prescription medication: oral fluconazole (150 mg weekly) + same diet as the placebo group Placebo group: low oxalate diet + calcium citrate supplement	Placebo controlled randomized clinical trial	Friedrich's criteria	No abnormal finding in vaginal discharge, symptom duration $\geq$ 6 mo and $<$ 2 y, no antibiotic, steroid, or antifungal therapy in the month before enrollment	Self-reported dyspareunia after treatment (unsatisfactory response/satisfactory response)	3 mo	Treatment group: 3/20 satisfactory response; 17/20 unsatisfactory response Placebo group: 6/20 satisfactory response; 14/20 unsatisfactory response	4 (criteria 1 not pertinent)
Munday[35]	N 11; age 17-80	Prescription medication: amitriptyline or other tricyclic antidepressant (starting dose: 10 mg daily)	Retrospective study	Friedrich's criteria	Vulvodynia	Self-reported symptom improvement after treatment (scale from 0% to 100%)	6 mo-4 y	5/11 complete response; 6/11 partial response	1, 2, 3, 4, 5, 7
Schmidt et al[36]	N 9; age 21-66	Prescription medication if lidocaine 5% cream ineffective: Amitriptyline (between 30 and 150 mg daily)	Prospective study	International Society for the Study of Vulvovaginal Disease criteria (ISSVD)	Symptom duration $>$ 12 mo	Quality of life and symptom improvement (before/after treatment): Skindex-29 Psychologic functioning (before/after treatment): Brief Symptom Inventory General health status (before/after treatment): Self-reported with a visual analog scale	At least 4 follow-ups every 1 mo or 3 mo when condition improved	No significant improvement of symptoms (absolute numbers not reported in the article)	1, 2, 3, 4, 5, 7
Segal et al[37]	N 1; age 24	Injections: Betamethasone (6 mg) + lidocaine 1%	Case study	Friedrich's criteria	—	Not reported	6 wk; 6 mo; 12 mo	Total relief of pain and a good quality of sex life	1, 2, 3, 4, 5, 6 (criteria 7 not pertinent)

(*continued*)

TABLE 2. (*continued*)

References	Sample Characteristics (N, Age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
Murina et al[38]	N 22; age 19-44	Injections: Methylprednisolone (40 mg, 20 mg,12 mg) + lidocaine (10 mg, 5 mg, 3 mg) (preceded by an application of lidocaine + prilocaine cream)	Prospective study	Superficial dyspareunia, vulvar burning, positive swab test	—	Self-reported dyspareunia, burning, and pain on swab test before/after treatment (scales from 0 «absent» to 3 «intense»)	Every month the first 3 mo; 6 mo; 9 mo; 1 y; 2 y	7/22 complete remission; 8/22 marked improvement; 7/22 no improvement	1, 2, 3, 4, 5 (criteria 7 not pertinent)
Romito et al[39]	N 2; age 41 and 43	Injections: Botulinum toxin A (80 U for one participant; 40 U for the other participant)	Case study	Not reported	Hypertonic pelvic floor muscles	Self-reported dyspareunia before/after treatment (scale from 0 «no pain» to 5 «spontaneous and continuous pain»)	Every month for 6 mo	2/2 complete relief of pain and of hypertonia of pelvic floor muscles for 5 to 6 mo	1, 2, 3, 4, 5 (criteria 7 not pertinent)
Brown et al[40]	N 2; age 24 and 43	Injections: Botulinum toxin A (20 U at baseline; 40 U 12 wk later)	Case study	Moderate to severe pain during attempted penetration and cotton-swab test	No vaginitis, no suspicious lesions on pelvic examination, no active neurologic disorder, no significant ongoing medical condition, no current major depression, and no abnormal laboratory values	Self-reported pain since last visit (VAS); sEMG measuring muscle hypertonicity before/after treatment; algesiometer measuring vestibular tenderness before/after treatment; weekly pain diary (scale from 0 «no pain» to «worst pain ever»)	12 wk; 24 wk	Self-reported pain: 29% reduction vs. 9% reduction sEMG: reduction of resting muscle tension, instability, recovery after contraction, and contraction amplitude (both patients) Vestibular tenderness: 67% reduction vs. 20% reduction	1, 2, 3, 4, 5 (criteria 7 not pertinent)
Dykstra and Presthus[41]	N 12; age 23-51	Injections: Botulinum toxin A (7 patients received 35 U; same patients + 5 new patients received 50 U about 3 mo later)	Pilot study	Severe pain on vestibular touch or attempted vaginal entry, tenderness to pressure within vulvar vestibule	Symptom duration > 6 mo, age ≥ 18, body weight ≥ 45.36 kg	Self-reported pain before/after treatment (scale from 0 to 10); Oral pain medication use before/after treatment; quality of life before/after treatment (authors do not specify the exact measure used)	1 mo; 12 wk or when pain back to baseline	35 U dose: Significant pain decrease for 8 wk 50 U dose: Significant pain decrease for 14 wk Pain medication use: 12/12 decreased	1, 2, 3, 4, 5, 6 (criteria 7 not pertinent)

N indicates sample size; sEMG, surface electromyography; VAS, Visual Analog Scale.

*1 = no control/comparison group; 2 = no placebo group; 3 = no random assignment; 4 = nonblind treatment evaluation; 5 = no definition of therapeutic success; 6 = little or no information on sample characteristics; 7 = no treatment adherence evaluation.

TABLE 3. Behavioral, Cognitive-behavioral, and Alternatives Treatment Studies

References	Sample Characteristics (N, Age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
Glazer et al[42]	N 1; age ?	Electromyographic (EMG) biofeedback	Case study	Unclear	—	Contractile strength, resting tension, and instability of pelvic floor muscles before/after treatment (sEMG); self-reported dyspareunia before/after treatment (scale from 0 to 10)	24 wk	Contractile strength: 61% increase resting tension: 58% decrease Instability: 60% decrease Dyspareunia: complete relief	1, 2, 3, 4, 5, 6
Bergeron et al[43]	N 35; age 20-66	Physical therapy	Retrospective study	Moderate to severe pain during intercourse and cotton-swab test, pain limited to the vulvar vestibule	No active infections, presence of vestibulodynia $\geq$ 6 mo	Self-reported dyspareunia after treatment (scale from 0 «a lot worse» to 7 «complete relief»); self-reported sexual functioning after treatment (structured telephone interview)	2-44 mo ($\bar{X}$ = 16 mo)	Dyspareunia:3/35 complete relief; 15/35 great improvement; 7/35 moderate improvement; 6/35 little improvement; 3/35 no improvement; 1/35 deterioration	1, 2, 3, 7
McKay et al[44]	N 29; age 25-48	Electromyographic (EMG) biofeedback	Prospective study	Friedrich's criteria	Level 2 or 3 vestibulodynia on Marinoff scale	Contractile strength of pelvic floor muscles before/after treatment (sEMG); self-reported dyspareunia before/after treatment (scale from 1 «least» to 10 «most»); self-reported presence of sexual activity before/after treatment	4-6 mo	Contractile strength: pain decreases significantly as contractile strength increases Dyspareunia: 15/29 negligible pain; 9/29 mild pain; 5/29 no improvement	1, 2, 3, 4
Danielsson et al[45]	N 46 (23 in each group, but 9 drop-outs) (thus 18 biofeedback, 19 topical lidocaine); age 18-36	Biofeedback (4 mo): 3 office sessions + 3 daily 10-min home training exercises Topical lidocaine (4 mo): 2% gel switched to 5%	Randomized clinical trial	Introital pain, severe vestibular tenderness during cotton-swab test, moderate to pronounced pain during most intercourse attempts	Symptom duration $\geq$ 6 mo, age $\geq$ 18, no severe medical, psychiatric or psychologic disorders, no ongoing pregnancy, no prior vestibulectomy or cognitive-behavioral therapy	Pain (before/after treatment): vestibular pain thresholds with vulvagesiometer; self-reported pain intensity (scale from 0 «best possible» to 100 «worst possible») Psychosexual function (before/after treatment):	6 mo; 12 mo	Biofeedback: 2/18 completely cured, 12/18 improved, 3/18 no change, 1/18 no answer Topical lidocaine: 2/19 completely cured, 10/19 improved, 3/19 no change, 4/19 no answer	3, 4

(*continued*)

TABLE 3. (*continued*)

References	Sample Characteristics (N, Age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
		ointment after second month (5 to 7 applications/d)				Short Form 36; 2 screening questions for depressive disorders from the Primary Care Evaluation of Mental Disorders; self-reported quality of life (scale from 0 «no suffering» to 10 «unbearable pain or suffering»)			
ter Kuile and Weijenborg[46]	N 76 (but 9 drop outs); age 18-35	Group cognitive-behavioral therapy (twelve 2-h sessions every 2 wk)	Prospective study	Pain during intercourse attempts for at least the past 6 mo, pain limited to activities involving vestibular pressure, diagnosis confirmed by gynecologist	Women between the ages of 18-45, in a heterosexual relationship for ≥ 3 mo, no lifelong vaginismus, no ongoing pregnancy, no ongoing treatment for dyspareunia or sexual/psychologic problems, no major affective, psychotic, substance-related or posttraumatic-stress (related to genitals) disorder	Pain (before/after treatment): self-reported pain (scale from 0 to 10); pain during cotton-swab test («pain» or «no pain») Vaginal muscle tension (before/after treatment): examiner introduced fingertip into vaginal introitus (scale from 1 «no tension» to 5 «extremely tense») Psychosexual function (before/after treatment): Symptom Checklist-90; Golombok Rust Inventory of Sexual Satisfaction; Perceived Pain Control Subscale of the Coping Strategy Questionnaire Marital dissatisfaction: Maudsley Marital Questionnaire	1 wk; 3 mo	Significantly less coital pain, vestibular pain during cotton-swab test, and vaginal muscle tension (absolute numbers not reported in the article)	1, 2, 3, 4, 6

Bergeron et al[27]	N 87 (29 in each group, but 9 drop outs) (thus 22 vestibulectomy, 28 group therapy, 28 biofeedback); age 18-50	3 Groups: Vestibulectomy; group cognitive-behavioral therapy (12 wk); electromyographic biofeedback (12 wk)	Randomized clinical trial	Dyspareunia > 6 mo, pain limited to intercourse and other activities involving vestibular pressure, moderate to severe pain in one or more locations of the vestibule during cotton-swab test	Women between the ages of 18-50, no pelvic or vulvar pain not clearly linked to intercourse, no ongoing treatment for dyspareunia, no active infections, no vaginismus, no major medical and/or psychiatric illness, no ongoing pregnancy	Pain (before/after treatment): Pain during cotton-swab test; self-reported dyspareunia (scale from 0 to 10); McGill Pain Questionnaire, Sexual function (before/after treatment): sexual History Form; Sexual Information Scale of the Derogatis Sexual Functioning Inventory; self-reported frequency of intercourse per month. Psychologic adjustment (before/after treatment): Brief Symptom Inventory	6 mo	Vestibulectomy: 15/22 complete relief or great improvement of pain Cognitive-behavioral therapy: 11/28 complete relief or great improvement of pain Biofeedback: 10/28 complete relief or great improvement of pain	3, 7
Fowler[47]	N 85; age 15-80	Hypocontactant vulvar therapy	Prospective study	Friedrich's criteria	No essential vulvodynia, no vulvar dermatoses, no symptoms of vaginal discharge and burning suggestive of vulvovaginitis	Degree of relief of vulvar pain and change of level of dyspareunia on Marinoff's scale (authors do not specify the exact evaluation technique used)	6 mo	17/85 complete response; 48/85 partial response; 20/85 no response (60% have an improvement of at least 1 level on Marinoff's scale)	1, 2, 3, 4, 6
Danielsson et al[48]	N 14 (but 1 drop out); age 19-26	Acupuncture (for 10 sessions, a total of 6 needles were inserted in the lower abdomen, lower back, and knees for 30-45 min)	Prospective study	Friedrich's criteria	—	Pain on vestibular touch evaluated by patient by pressing a probe to her vulvar vestibule each week (VAS); self-reported quality of life before/after treatment (scale from 0 «no suffering» to 10 «unbearable pain or suffering»)	1 wk; 3 mo	Results for pain not reported because of unreliable method of assessment	1, 2, 3, 4 (criteria 6 not pertinent)
Kandyba and Binik[49]	N 1; age 26	Hypnotherapy (8 sessions)	Case study	Not reported	—	Dyspareunia, anticipatory anxiety, and sense of personal control over the pain self-reported verbally before/after treatment	2 mo; 1 y	Complete pain relief	1, 2, 3, 4, 7 (criteria 6 not relevant)

(*continued*)

TABLE 3. (*continued*)

References	Sample Characteristics (N, Age)	Treatment	Design	Vestibulodynia Diagnosis	Other Selection Criteria	Measurement of Pain and Other Variables	Follow-up Length	Pain Outcome	Comments*
Pukall et al[50]	N 8; age 19-36	Hypnotherapy (6 sessions)	Prospective study	Friedrich's criteria	Pain occurs on most intercourse attempts for $\geq$ 6 mo, pain limited to intercourse and other activities involving vestibular pressure, mean pain rating of at least 4 on a 0-10 Likert scale during cotton-swab test, moderate-high score on the Harvard Group Scale of Hypnotic Susceptibility	Pain (before/after treatment): Pain during cotton-swab test; vestibular pain thresholds with vulvagesiometer; McGill Pain Questionnaire; Pain Catastrophizing Scale; pain intensity and unpleasantness ratings (scales from 0 to 10) Psychosexual function (before/after treatment): Female Sexual Function Index; State-Trait Anxiety Scale; Beck Depression Inventory-II; Brief Symptom Inventory	1 mo; 6 mo	Pain: Significant difference during cotton-swab test, on Pain Catastrophizing Scale, and Likert scales for pain intensity and unpleasantness; no significant difference in vestibular pain thresholds; marginally significant difference on MPQ (absolute numbers not reported in the article)	1, 2, 3, 4, 6
Greenstein et al[51]	N 7; age	Low oxalate diet + calcium citrate supplement	Prospective study	Friedrich's criteria	No other coexisting vulvar/vaginal condition, no previous surgery for vestibulodynia	Improvement in vestibulodynia symptoms; ability to have pain-free sexual intercourse after treatment (methods of measurement not reported)	3 mo	1/7 showed improvement of symptoms and was able to have pain-free intercourse	1, 2, 3, 4, 5, 6

N indicates sample size; $\bar{X}$, mean; sEMG, surface electromyography.

*1 = no control/comparison group; 2 = no random assignment; 3 = nonblind treatment evaluation; 4 = no definition of therapeutic success; 5 = little or no information on sample characteristics; 6 = no treatment adherence evaluation; 7 = some participants received another form of treatment between the intervention and follow-up.

surgical procedures, with 61% and 74% of participants reporting a complete response.[24,25]

Two randomized clinical trials examined surgical treatment. Bornstein and Abramovici[26] compared the efficacy of total perineoplasty (ie, *with* excision of the anterior vestibule) to partial perineoplasty (ie, *without* excision of the anterior vestibule) plus interferon injections in the anterior vestibule. Findings revealed no significant difference between the 2 groups, with 67% of participants in the total perineoplasty group having a complete response to treatment compared with 70% in the partial perineoplasty with interferon group. Moreover, only minor side effects of interferon injections were observed, whereas excessive postoperative bleeding occurred in 1 woman who underwent total perineoplasty. Nevertheless, given the absence of a partial perineoplasty group without interferon, it is impossible to know whether or not interferon injections significantly improve the surgery's efficacy.

Last, by means of a randomized clinical trial, Bergeron et al[27] compared the efficacy of vestibulectomy to that of 2 behavioral treatments—biofeedback and cognitive-behavioral group therapy (CBGT). Pain reduction was twice as high for participants who had the vestibulectomy than those who participated in one of the behavioral treatments, with 68% of vestibulectomy participants reporting complete or significant pain relief. Despite these encouraging results, 9% of the vestibulectomy participants stated that their pain worsened at follow-up, whereas no such deterioration was signaled by the participants of the 2 other groups.

As shown in Table 1, the surgical treatment studies have several major methodological limitations. Indeed, only 2 studies are randomized and the great majority of studies have no control or comparison group. Moreover, most of the studies do not include a double-blind evaluation process nor provide an a priori definition of therapeutic success. As well, about half of the publications concerning surgery contain an inadequate description of their sample, which greatly complicates the comparison of studies. Half of the studies fail to provide a baseline pain measure, conducting only a posttreatment evaluation. Furthermore, the follow-up periods vary not only from one study to the next, but also within studies. Surgical techniques also differ between studies. In addition, the majority of studies evaluate pain subjectively, using a rudimentary qualitative scale despite the fact that better standardized evaluation methods exist (eg, cotton swab test for pain evaluation at each vestibular site, the McGill Pain Questionnaire).[54] Finally, almost half of the authors mention that the participants have received other forms of treatment between surgery and follow-up, which makes it impossible to distinguish the efficacy of the surgery from that of other treatments received. Despite those methodological limitations, when we compare its positive impact on pain reduction to the relatively low number of reported risks and complications, surgery is at present a sound treatment option—albeit not a first line intervention. Future studies focusing on who benefits most from this procedure would help to further reduce the risk of failure.

Medical Treatments

Bergeron et al[14] stated in their 1997 review that medical treatments were largely underinvestigated, especially considering their prevalent use. In fact, being less invasive than vestibulectomy, medical interventions are frequently prescribed as the first attempt to relieve vulvar pain. Nevertheless, their degree of efficacy was still scarcely documented until recently. In the last 10 years, 14 studies focusing on medical treatments have been published. They can be divided into 3 categories: topical applications, systemic medications, and injections (Table 2).

First, 5 studies examined whether the localized application of different medicated creams helps to alleviate the pain of provoked vestibulodynia. Steinberg et al[28] retrospectively evaluated the effects of capsaicin 0.025% applied daily for 12 weeks. Although results showed a significant improvement of dyspareunia, the authors did not indicate the specific number of participants for whom the treatment proved successful. Moreover, given the preventive application of lidocaine, it is impossible to isolate the effect of capsaicin. Murina et al[29] also studied the application of capsaicin cream preceded by a preventive application of lidocaine, but did so with a prospective design, a higher dosage, and a longer treatment duration. Results showed that 59% of participants reported an improvement of their pain symptoms. However, the symptoms reappeared about 15 days after discontinuation of capsaicin. As well, despite the preventive application of lidocaine, all participants indicated an intense burning sensation for 40 to 60 minutes after capsaicin application. Lidocaine 5% was also examined as a treatment in and of itself in a prospective study by Zolnoun et al.[30] After a localized, nightly application for about 7 weeks, 57% of the women indicated a reduction of their dyspareunia by at least 50%.

Morrison et al[31] prospectively examined the efficacy of ketoconazole 2% applied 3 times daily on the vulvar region of women with provoked vestibulodynia. Results revealed a complete recovery or improvement of pain for 44% of participants. Last, Nyirjesy et al[32] conducted the only placebo-controlled randomized, double-blind clinical trial, concerning the efficacy of a topical application, namely cromolyn 4%, applied locally for a period of 3 months. Results showed that the difference in symptom reduction between the participants in the treatment group (54%) and those in the placebo group (38%) was not significant.

Four treatment studies focusing on the use of systemic medications were identified. Pagano[33] prospectively examined the efficacy of a pain management protocol including xylocaine and either: (1) ketoconazole or fluconazole, (2) amitriptyline, or (3) carbamazepine. Results revealed a success rate of 67% for the oral antifungal treatment, 60% for amitriptyline, and 13% for carbamazepine. Bornstein et al[34] examined the efficacy of fluconazole in the only randomized clinical trial with

placebo group concerning oral agents. After following a regimen of 1 pill per week during 6 months, there was no significant difference between the treatment group and the placebo group, with success rates reaching 15% and 30%, respectively.

Two nonexperimental studies concerning systemic medications focused on amitriptyline. Munday's[35] retrospective study showed that 45% of participants reported a complete response to the treatment. Nonetheless, given that some participants also benefited from psychotherapy, it is impossible to attribute improvement exclusively to amitriptyline. In contrast, the prospective study by Schmidt et al[36] showed that participants did not report a significant improvement in their vulvar symptoms or quality of life after their amitriptyline treatment. However, the small sample size or the low baseline pain level could possibly explain these nonsignificant results. Moreover, although the authors calibrated the dosage for each participant, the side effect profile of amitriptyline remains a downside of this intervention. Though administered at doses lower than for the treatment of depression, this type of medication may have negative side effects on sexuality, such as diminished sexual arousal, which may contribute to an increase in pain.[55]

Five studies investigated whether specific types of injections might help decrease vulvar pain. In a case study, Segal et al[37] examined the effects of subcutaneous injections of betamethasone (corticosteroid) plus lidocaine administered at 1-week intervals in the vestibule. At follow-up, the participant indicated a complete relief of her pain and a good quality of sex life. The efficacy of methylprednisolone injections (corticosteroid) plus lidocaine were studied prospectively by Murina et al.[38] Results revealed that 32% of participants had a complete remission of their pain symptoms and 36% had a marked improvement.

The 3 other studies involving injections focused on botulinum toxin A, which essentially aims to reduce hypertonicity of pelvic floor muscles. In a case study by Romito et al,[39] the 2 participants reported complete pain relief within 2 to 7 days after the injections, for a duration of 5 to 6 months. Brown et al[40] conducted a similar case study where one participant indicated a modest reduction of her pain whereas the other participant reported very little reduction. Last, Dykstra and Presthus[41] conducted a pilot study with 12 patients who reported a significant reduction of their pain for a duration of 8 to 14 weeks after the injection, with a higher dosage leading to a longer lasting effect. Nevertheless, only 25% of patients reported a significant improvement of their quality of life upon follow-up. The different results obtained in those 3 studies are most probably explained by the fact that the optimum dose and injection technique of botulinum toxin still remain to be determined.

In general, the medical treatment research has the same methodological limitations as that pertaining to surgery (Table 2). Among others, the great majority of studies was neither randomized nor double-blind, and did not provide an a priori definition of therapeutic success. However, the medical treatment studies more often included an adequate description of their sample and pretreatment and posttreatment pain evaluations, in addition to using more objective measures of pain. Unfortunately, treatment compliance was rarely assessed in the studies reviewed, which complicates the interpretation of results. As well, many studies combine their principal treatment with the application of an analgesic cream, which constitutes a treatment in and of itself (eg, lidocaine). Furthermore, the studies involving local injections have a very small number of patients, which limits the conclusions that can be drawn. Last, despite the large placebo effect detected in the study by Nyirjesy et al[32] and Bornstein et al,[34] only 2 studies included a placebo group. Notwithstanding those methodological limitations, it seems that when we take account (1) the impact of the treatment on pain reduction, (2) the profile of side effects, and (3) the quality of the different studies, lidocaine 5% applied daily and combined injections of both corticosteroid and lidocaine stand out as 2 promising medical treatments. However, more controlled studies are necessary to further document up to what point medical treatments significantly relieve the pain of women with provoked vestibulodynia.

Behavioral and Cognitive-behavioral Treatments

In 1997, only one study on biofeedback and one on behavioral sex therapy had been published. Since then, biofeedback has become more popularized, with 4 studies supporting its usefulness, whereas cognitive-behavioral therapy remains marginalized to some extent, although 2 more studies attesting to its value have been published in the last decade (Table 3).

Biofeedback is largely used to treat various types of chronic or recurrent pain and has been adapted to treat provoked vestibulodynia via repeated sequences of contraction/relaxation of the pelvic floor muscles. Its main objective is to decrease hypertonicity, which is suspected of being partly responsible of exacerbating vulvo-vaginal pain.[14,56,57] Glazer et al[42] conducted a case study with 1 woman who had received biofeedback treatment. At follow-up, the patient reported complete pain relief. Bergeron et al[43] retrospectively studied physical therapy (including biofeedback) for the rehabilitation of the pelvic floor and found a 52% pain reduction success rate and a significant improvement of women's sexual functioning. In McKay et al's[44] prospective biofeedback study, 83% of women indicated a significant decrease of their pain, and 83% of the latter indicated having become sexually active after treatment. Finally, Danielsson et al[45] conducted the only study that compared the efficacy of a behavioral treatment (biofeedback) to that of a medical treatment (topical lidocaine) and did so with a randomized clinical trial. The 2 treatments significantly improved pain thresholds, quality of life, and psychosexual functioning of participants. Nevertheless, no significant difference was found between

the 2 treatments, which may be due to a lack of statistical power or to low compliance by the biofeedback group.

Cognitive-behavioral therapy for provoked vestibulodynia aims to decrease pain, reduce fear of pain, and reestablish satisfying sexual functioning. ter Kuile and Weijenborg[46] prospectively evaluated the efficacy of this therapy in a group format with a large sample. The authors reported that participants had a significant reduction of dyspareunia, in addition to a significant improvement of sexual satisfaction and perceived pain control from pretreatment to posttreatment. However, no significant difference was reported with regard to marital satisfaction and psychologic distress, probably because these did not reach clinical thresholds at pretreatment.

Bergeron et al[27] conducted the only randomized study that examined cognitive-behavioral therapy. More specifically, participants were randomized either to CBGT, biofeedback, or vestibulectomy. Findings indicate that the participants of the 3 treatment groups reported significant improvements of their pain. The average percentage of pain reduction was 47% to 70% for vestibulectomy, 19% to 35% for biofeedback, and 21% to 38% for CBGT. Vestibulectomy was thus shown to be significantly more successful than the 2 other treatments in terms of pain reduction. Nevertheless, the 3 treatments resulted in equally significant psychosexual functioning improvements. Last, the CBGT group presented a significantly lower attrition rate than the vestibulectomy group and participants were more satisfied with their treatment than those who took part in biofeedback.

As shown in Table 3, the great majority of behavioral and cognitive-behavioral treatment studies have the same methodological limitations than the medical and surgical treatment studies (eg, no randomization, no double-blind evaluation). However, the majority of behavioral and cognitive-behavioral treatment studies used objective measures for evaluating pain and sexual function, described their sample well, and conducted pretreatment and posttreatment evaluations of pain and sexual function. Although treatment compliance was measured more often in the behavioral treatment studies than in the medical ones, it was not always reported in the article, complicating the interpretation of results. Other controlled studies are required to further corroborate the results obtained so far and to identify predictors of treatment outcome. Given that behavioral treatments lead to similar therapeutic success than medical interventions, and given the documented absence of associated negative side effects, patients might benefit from being more informed about these treatment options.

Alternative Treatments

Though no studies on alternative treatments figured in the review of Bergeron et al,[14] 5 studies have since been published (Table 3). First, Fowler[47] prospectively evaluated a hypoallergenic vulvar hygiene program comprised of 14 recommendations specifically targeted toward vestibulodynia. Results showed that 20% of participants had a complete response to the program whereas 57% had a partial response. Unfortunately, due to the combination of many strategies of pain relief, it is impossible to identify the unique impact of each of these. Danielsson et al[48] prospectively examined the efficacy of acupuncture, showing that participants reported a significant improvement of their quality of life after treatment. Regrettably, pain results were not included in their article because the evaluation method was found to be ineffective.

Kandyba and Binik[49] conducted a case study with 1 woman having received hypnotherapy. At follow-up, the woman reported complete pain relief, a nearly complete reduction of her anticipatory anxiety, and a feeling of personal control over her pain. Though these results are encouraging, the participant had received physical therapy sessions before and during the hypnotherapy treatment. Pukall et al[50] led a similar hypnotherapy study in which the 8 women showed a significant reduction of pain and a significant improvement in sexual satisfaction. Last, although certain treatment guidelines for provoked vestibulodynia suggest a low-oxalate diet,[12] only one study of that treatment was identified since 1996. Greenstein et al[51] showed that only one of 7 participants experienced an improvement of her symptoms of vestibulodynia and was capable of having pain-free sexual intercourse after treatment.

The methodological limitations of the 5 alternative treatment studies are the same as those of the preceding sections (eg, no randomization, no control group) (Table 3). Furthermore, the small number of participants included in these studies clearly shows that the evaluation of these treatments is still in its preliminary phase.

DISCUSSION

To date, attempts to treat provoked vestibulodynia have largely been conducted on a trial-and-error basis. Despite some 40-treatment studies published since 1996, it remains difficult to choose the most adequate intervention for any given patient. Indeed, the lack of randomized clinical trials and various other methodological weaknesses complicate the conclusions that can be drawn concerning the efficacy of available treatments. Nevertheless, the state of research on provoked vestibulodynia has progressed significantly over the past decade. In fact, at the time of Bergeron et al's[14] review, the great majority of knowledge was based on case studies and retrospective designs. Today, the research is comprised of more prospective studies and of a small number of randomized clinical trials.

On the basis of the results of randomized and prospective studies, vestibulectomy still seems to be the most efficacious treatment option to date, although one that cannot be recommended as a first line intervention given its degree of invasiveness. More specifically, surgical treatment was shown to be twice as efficacious as behavioral treatments in the randomized outcome study by Bergeron et al,[27] and it continually obtains the best success rates in prospective studies. However, these

positive findings need to be weighed against the potential risks and/or negative side effects of vestibulectomy, which may include a worsening of the pain,[5,16,18,19,23,27] a recurrence of the pain,[5] decreased lubrication,[17] and minor postsurgical complications.[17,18,20,22,25,26] Future studies need to document and define possible negative side effects more systematically.

Despite the fact that they are offered as the predominant treatment choice, medical interventions remain understudied. Results from the small number of clinical trials are somewhat discouraging, yet the uncontrolled prospective studies show that daily applications of lidocaine and corticosteroid-lidocaine injections provide considerable relief to women with provoked vestibulodynia, while being minimally invasive. Thus, these medical treatments merit further investigation by way of placebo-controlled randomized clinical trials.

Biofeedback and cognitive-behavioral therapy are promising noninvasive treatments. According to prospective studies, these 2 therapeutic modalities not only have success rates similar to certain medical treatments, but they also have the advantage of targeting both the reduction of pain and its psychosexual consequences (eg, reduced desire and arousal).[6,58–62] Finally, alternative treatments should be the object of more large scale prospective studies so that their efficacy and safety can be determined.

The methodology of future research would benefit from some improvements. Namely, given the large placebo effect detected in experimental studies conducted so far,[32,34] studies should include a placebo group whenever possible (eg, medical treatments). Moreover, to quantify the changes in pain after treatment, validated measures need to be included (eg, the McGill Pain Questionnaire[54]) rather than home-made, dichotomous scales (eg, success or failure) still used in most of the studies. In addition, pain evaluations must not only be conducted posttreatment but also pretreatment to determine the scope of the change effected by the intervention. To verify whether the therapeutic benefits are maintained over the long term, researchers should also ensure that the length of follow-ups is adequate (eg, follow-up of at least 6 mo). Last, vestibulodynia goes far beyond the experience of pain and has serious consequences on sexual function, dyadic adjustment, psychologic well-being, and quality of life.[5–7] Nevertheless, studies that measure the impact of treatment on these variables are rare—an important limitation that should be addressed in future studies.

From a theoretical standpoint, research on the treatment of provoked vestibulodynia still suffers from a lack of consideration of the biopsychosocial approach presently accepted and successfully used in the field of chronic and recurrent pain.[63] This model not only takes into account the importance of biomedical factors involved in the development, maintenance, and exacerbation of pain, but also of cognitive, affective, behavioral, and interpersonal factors. However, to date, the great majority of treatment studies on vestibulodynia adopt a unidimensional biomedical perspective despite the fact that many authors recommend combining medical with cognitive-behavioral or behavioral treatments.[20,24,27,31,35,45,47] Consequently, by targeting the multiple aspects of vestibulodynia rather than the pain in an isolated way, a multimodal approach could prove optimal. In fact, the combination of treatments could have a cumulative effect with regard to efficacy and could thus (1) become an alternative to surgery for patients who find this modality too invasive or (2) allow to improve the success rates of surgery by combining it with, for example, a behavioral intervention.[64] The next generation of treatment studies must try to determine whether a multimodal approach is more advantageous than the unidimensional one which still prevails in most centers, while taking into consideration the multiple domains of functioning (eg, quality of life, sexual satisfaction) that are affected by this distressing urogenital pain problem.

REFERENCES

1. Skene AJC. *Treatise on the Disease of Women*. New York: Appleton and Company; 1889.
2. Friedrich EG Jr. Vulvar vestibulitis syndrome. *J Reprod Med*. 1987;32:110–114.
3. Goetsch MF. Vulvar vestibulitis: prevalence and historic features in a general gynecologic practice population. *Am J Obstet Gynecol*. 1991;164:1609–1614.
4. Harlow BL, Wise LA, Stewart EG. Prevalence and predictors of chronic lower genital tract discomfort. *Am J Obstet Gynecol*. 2001; 185:545–550.
5. Bergeron S, Bouchard C, Fortier M, et al. The surgical treatment of vulvar vestibulitis syndrome: a follow-up study. *J Sex Marital Ther*. 1997;23:317–325.
6. Meana M, Binik YM, Khalife S, et al. Biopsychosocial profile of women with dyspareunia. *Obstet Gynecol*. 1997;90:583–589.
7. Arnold LD, Bachmann GA, Rosen R, et al. Vulvodynia: characteristics and associations with comorbidities and quality of life. *Obstet Gynecol*. 2006;107:617–624.
8. Bergeron S, Binik YM, Khalife S, et al. Vulvar vestibulitis syndrome: reliability of diagnosis and evaluation of current diagnostic criteria. *Obstet Gynecol*. 2001;98:45–51.
9. Masheb RM, Lozano C, Richman S, et al. On the reliability and validity of physician ratings for vulvodynia and the discriminant validity of its subtypes. *Pain Med*. 2004;5:349–358.
10. American College of Obstetricians and Gynecologists. Vulvar nonneoplastic epithelial disorders. *Int J Gynaecol Obstet*. 1998;60: 181–188.
11. Stewart EG. Vestibulodynia. *UpToDate*. 2006.
12. Haefner H, Collins S, Davis GD, et al. The vulvodynia guideline. *J Low Genit Tract Dis*. 2005;9:40–51.
13. Bachmann GA, Rosen R, Pinn VW, et al. Vulvodynia: a state-of-the-art consensus on definitions, diagnosis and management. *J Reprod Med*. 2006;51:447–456.
14. Bergeron S, Binik YM, Khalife S, et al. Vulvar vestibulitis syndrome: a critical review. *Clin J Pain*. 1997;13:27–42.
15. Chaim W, Meriwether C, Gonik B, et al. Vulvar vestibulitis subjects undergoing surgical intervention: a descriptive analysis and histopathological correlates. *Eur J Obstet Gynecol Reprod Biol*. 1996;68: 165–168.
16. Gaunt G, Good A, Stanhope CR. Vestibulectomy for vulvar vestibulitis. *J Reprod Med*. 2003;48:591–595.
17. Traas MA, Bekkers RL, Dony JM, et al. Surgical treatment for the vulvar vestibulitis syndrome. *Obstet Gynecol*. 2006;107:256–262.
18. Goldstein AT, Klingman D, Christopher K, et al. Surgical treatment of vulvar vestibulitis syndrome: outcome assessment derived from a postoperative questionnaire. *J Sex Med*. 2006;3:923–931.

19. McCormack WM, Spence MR. Evaluation of the surgical treatment of vulvar vestibulitis. *Eur J Obstet Gynecol Reprod Biol*. 1999;86: 135–138.
20. Goetsch MF. Simplified surgical revision of the vulvar vestibule for vulvar vestibulitis. *Am J Obstet Gynecol*. 1996;174:1701–1705.
21. Bornstein J, Goldik Z, Stolar Z, et al. Predicting the outcome of surgical treatment of vulvar vestibulitis. *Obstet Gynecol Surv*. 1997; 52:618–619.
22. Schneider D, Yaron M, Bukovsky I, et al. Outcome of surgical treatment for superficial dyspareunia from vulvar vestibulitis. *J Reprod Med*. 2001;46:227–231.
23. Granot M, Zimmer EZ, Friedman M, et al. Association between quantitative sensory testing, treatment choice, and subsequent pain reduction in vulvar vestibulitis syndrome. *J Pain*. 2004;5:226–232.
24. Kehoe S, Luesley D. Vulvar vestibulitis treated by modified vestibulectomy. *Int J Gynaecol Obstet*. 1999;64:147–152.
25. Lavy Y, Lev-Sagie A, Hamani Y, et al. Modified vulvar vestibulectomy: simple and effective surgery for the treatment of vulvar vestibulitis. *Eur J Obstet Gynecol Reprod Biol*. 2005;120: 91–95.
26. Bornstein J, Abramovici H. Combination of subtotal perineoplasty and interferon for the treatment of vulvar vestibulitis. *Gynecol Obstet Invest*. 1997;44:53–56.
27. Bergeron S, Binik YM, Khalifé 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.
28. Steinberg AC, Oyama IA, Rejba AE, et al. Capsaicin for the treatment of vulvar vestibulitis. *Am J Obstet Gynecol*. 2005;192: 1549–1553.
29. Murina F, Radici G, Bianco V. Capsaicin and the treatment of vulvar vestibulitis syndrome: a valuable alternative? *Med Gen Med*. 2004;6:48.
30. Zolnoun DA, Hartmann KE, Steege JF. Overnight 5% lidocaine ointment for treatment of vulvar vestibulitis. *Obstet Gynecol*. 2003;102:84–87.
31. Morrison GD, Adams SJ, Curnow JS, et al. A preliminary study of topical ketoconazole in vulvar vestibulitis syndrome. *J Dermatolog Treat*. 1996;7:219–221.
32. Nyirjesy P, Sobel JD, Weitz MV, et al. Cromolyn cream for recalcitrant idiopathic vulvar vestibulitis: results of a placebo controlled study. *Sex Transm Infect*. 2001;77:53–57.
33. Pagano R. Vulvar vestibulitis syndrome: an often unrecognized cause of dyspareunia. *Aust N Z J Obstet Gynaecol*. 1999;39:79–83.
34. Bornstein J, Livnat G, Stolar Z, et al. Pure versus complicated vulvar vestibulitis: a randomized trial of fluconazole treatment. *Gynecol Obstet Invest*. 2000;50:194–197.
35. Munday PE. Response to treatment in dysaesthetic vulvodynia. *J Obstet Gynaecol*. 2001;21:610–613.
36. Schmidt S, Bauer A, Greif C, et al. Vulvar pain. Psychological profiles and treatment responses. *J Reprod Med*. 2001;46:377–384.
37. Segal D, Tifheret H, Lazer S. Submucous infiltration of betamethasone and lidocaine in the treatment of vulvar vestibulitis. *Eur J Obstet Gynecol Reprod Biol*. 2003;107:105–106.
38. Murina F, Tassan P, Roberti P, et al. Treatment of vulvar vestibulitis with submucous infiltrations of methylprednisolone and lidocaine. An alternative approach. *J Reprod Med*. 2001;46:713–716.
39. Romito S, Bottanelli M, Pellegrini M, et al. Botulinum toxin for the treatment of genital pain syndromes. *Gynecol Obstet Invest*. 2004;58:164–167.
40. Brown CS, Glazer HI, Vogt V, et al. Subjective and objective outcomes of botulinum toxin type A treatment in vestibulodynia: pilot data. *J Reprod Med*. 2006;51:635–641.
41. Dykstra DD, Presthus J. Botulinum toxin type A for the treatment of provoked vestibulodynia: an open-label, pilot study. *J Reprod Med*. 2006;51:467–470.
42. Glazer HI, Marinoff SC, Sleight IJ. Web-enabled Glazer surface electromyographic protocol for the remote, real-time assessment and rehabilitation of pelvic floor dysfunction in vulvar vestibulitis syndrome. A case report. *J Reprod Med*. 2002;47:728–730.
43. Bergeron S, Brown C, Lord MJ, et al. Physical therapy for vulvar vestibulitis syndrome: a retrospective study. *J Sex Marital Ther*. 2002;28:183–192.
44. McKay E, Kaufman RH, Doctor U, et al. Treating vulvar vestibulitis with electromyographic biofeedback of pelvic floor musculature. *J Reprod Med*. 2001;46:337–342.
45. Danielsson I, Torstensson T, Brodda-Jansen G, et al. EMG biofeedback versus topical lidocaine gel: a randomized study for the treatment of women with vulvar vestibulitis. *Acta Obstet Gynecol Scand*. 2006;85:1360–1367.
46. ter Kuile MM, Weijenborg PT. A cognitive-behavioral group program for women with vulvar vestibulitis syndrome (VVS): factors associated with treatment success. *J Sex Marital Ther*. 2006; 32:199–213.
47. Fowler RS. Vulvar vestibulitis: response to hypocontactant vulvar therapy. *J Low Genit Tract Dis*. 2000;4:200–203.
48. Danielsson I, Sjoberg I, Ostman C. Acupuncture for the treatment of vulvar vestibulitis: a pilot study. *Acta Obstet Gynecol Scand*. 2001;80:437–441.
49. Kandyba K, Binik YM. Hypnotherapy as a treatment for vulvar vestibulitis syndrome: a case report. *J Sex Marital Ther*. 2003;29: 237–242.
50. Pukall CF, Kandyba K, Amsel R, et al. Efficacy of hypnosis for the treatment of vulvar vestibulitis syndrome: a preliminary investigation. *J Sex Med*. 2007;4:417–425.
51. Greenstein A, Militscher I, Chen J, et al. Hyperoxaluria in women with vulvar vestibulitis syndrome. *J Reprod Med*. 2006;51:500–502.
52. Marinoff SC, Turner ML. Vulvar vestibulitis syndrome: an overview. *Am J Obstet Gynecol*. 1991;165:1228–1233.
53. Woodruff JD, Parmley TH. Infection of the minor vestibular gland. *Obstet Gynecol*. 1983;62:609–612.
54. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain*. 1975;1:277–299.
55. Ashton AK. The new sexual pharmacology: a guide for the clinicians. In: Leiblum SR, ed. *Principles and Practice of Sex Therapy*. 4th ed. New York, NY: The Guilford Press; 2007: 509–541.
56. Bergeron S, Binik YM, Khalife S, et al. The treatment of vulvar vestibulitis syndrome: towards a multimodal approach. *Sex Marital Ther*. 1997;12:305–311.
57. Bergeron S, Binik YM, Khalife S. In favor of an integrated pain-relief treatment approach for vulvar vestibulitis syndrome. *J Psychosom Obstet Gynaecol*. 2002;23:7–9.
58. Reissing ED, Binik YM, Khalife S, et al. Vaginal spasm, pain, and behavior: an empirical investigation of the diagnosis of vaginismus. *Arch Sex Behav*. 2004;33:5–17.
59. Bergeron S, Lord MJ. The integration of pelvi-perineal re-education and cognitive-behavioral therapy in the multidisciplinary treatment of the sexual pain disorders. *Sex Marital Ther*. 2003;18:135–141.
60. Meana M, Binik I, Khalife S, et al. Affect and marital adjustment in women's rating of dyspareunic pain. *Can J Psychiatry*. 1998;43: 381–385.
61. Payne KA, Binik YM, Amsel R, et al. When sex hurts, anxiety and fear orient attention towards pain. *Eur J Pain*. 2004;9:427–436.
62. Pukall CF, Binik YM, Khalife S, et al. Vestibular tactile and pain thresholds in women with vulvar vestibulitis syndrome. *Pain*. 2002; 96:163–175.
63. Turk DC, Okifuji A. Psychological factors in chronic pain: evolution and revolution. *J Consult Clin Psychol*. 2002;70:678–690.
64. Schover LR, Youngs DD, Cannata R. Psychosexual aspects of the evaluation and management of vulvar vestibulitis. *Am J Obstet Gynecol*. 1992;167:630–636.

