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Research Article

Chronic Vulvar Discomfort: Clinical Profiles, Pain Mapping, and Diagnostic Insights

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Abstract

This study provides a comprehensive clinical evaluation of women with chronic vulvar discomfort (CVD), focusing on two primary conditions underlying these symptoms: vulvodynia and vulvar dermatoses. A total of 328 women were enrolled in the DATRIV study (Diagnostic Accuracy of Three Rings Vulvoscopy) and categorized into four clinical groups: asymptomatic women with a normal vulva, asymptomatic women with impaired vulvar skin, and symptomatic patients diagnosed with either vulvodynia or vulvar dermatosis. Each participant underwent structured symptom profiling, sexual activity assessment, and targeted pain localization using the cotton-swab (Q-tip) test, systematically applied across a novel three-ring anatomical model (outer, middle, and inner vulvar rings). Pain response was further mapped using a clock-face method. Dyspareunia severity was graded with the Marinoff Index, and potential symptom triggers were explored through standardized behavioral and environmental questionnaires. Clinical data were analyzed using StatSoft, Statistica 12, and SPSS 20. The Institutional Review Board of Polyclinic Harni approved the study, and all participants provided written informed consent. Findings showed that 100% of women with vulvodynia and 80.5% of those with vulvar dermatoses experienced dyspareunia (Marinoff grades 1–3), in contrast to only 1.3% of asymptomatic controls. Marinoff Index 2 (pain that occasionally prevents intercourse) was observed in 54.8% of vulvodynia and 52.9% of dermatosis patients. In comparison, Marinoff Index 3 (pain that completely precludes intercourse) was present in 15.1% and 26.5%, respectively. Pain mapping revealed that the inner vulvar ring, especially at 4, 6, and 8 o'clock, was the most pain-sensitive region in patients with vulvodynia, consistent with localized nociceptor hypersensitivity. Environmental and behavioral triggers—such as menstruation (54.9% in vulvodynia vs. 36.5% in dermatosis), tampon use (65.9% vs. 42.8%), urination-related discomfort (47.6% vs. 36.6%), cycling (61.9% vs. 47.4%), and tight clothing (reported symptom aggravation in 85.4% of vulvodynia patients vs. 46.3% of dermatosis patients)—were frequently identified, reflecting distinct trigger profiles between the conditions. This study highlights the diagnostic value of combining the Marinoff Index and cotton-swab test with structured pain mapping using the three-ring vulvar model and clock-face method. Together, these tools offer a reproducible and clinically meaningful framework for identifying vulvar pain phenotypes, enabling more individualized and effective therapeutic strategies for women with chronic vulvar pain syndromes.

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1. Introduction

Chronic vulvar discomfort (CVD) refers to persistent pain, itching, or discomfort in the vulvar region, affecting millions of women globally [1-5]. Up to 16% of women may experience vulvar pain in their lives, but diagnosing it remains challenging [1, 2]. Conditions like vulvodynia are often misdiagnosed as vulvovaginal inflammation due to inflammatory cytokine activation, while sclerosant vulvar dermatoses frequently present diagnostic delays as early signs mimic inflammatory changes [6-11]. While histopathological examination remains the gold standard for diagnosing vulvar lesions, a definitive histopathological profile for vulvodynia has not been established despite extensive efforts to characterize it [4, 8, 13]. Conversely, the diagnosis of lichen sclerosus becomes reliably achievable only in its later stages, when the clinical and histopathological manifestations of the disease are more pronounced [9-11]. This diagnostic delay underscores the critical need for early and thorough clinical evaluation.

CVD is generally categorized into primary or secondary forms [8, 13]. Primary CVD, commonly known as vulvodynia, is characterized by pain without an identifiable cause [14, 15]. Its multifactorial etiology involves nerve dysfunction, musculoskeletal abnormalities, hormonal imbalances, inflammation, and psychological influences [3, 12, 16, 17].

Secondary CVD arises from specific conditions, such as vulvar dermatoses (e.g., lichen sclerosus, lichen planus), infections, or hormonal changes, all of which possess distinct inflammatory and autoimmune components that require tailored therapeutic approaches [8, 10, 15, 18]. Differentiating between primary and secondary vulvar discomfort demands clinical expertise, as secondary forms often present with visible changes, whereas primary vulvodynia lacks prominent clinical findings [19]. A comprehensive evaluation, including biopsies, laboratory tests, visual examinations, and medical history, is essential [20]. Equally important is the collaboration between specialists, such as gynecologists, pain experts, and pelvic floor physical therapists. This teamwork is beneficial and necessary for managing CVD effectively [21, 22].

1.1. Patient History

Accurate diagnosis is crucial for guiding treatment. A detailed patient history documenting symptom duration and characteristics like pain, itching, burning, discomfort, and dyspareunia is essential [8, 18, 23, 24].

Dyspareunia, defined as pain during intercourse, is a significant concern for CVD patients [8, 19]. The proper assessment of dyspareunia is critical for effective treatment planning [24]. The presentation of dyspareunia may vary depending on the underlying condition—vulvodynia or vulvar dermatosis—and factors such as pain severity, individual thresholds, and psychological influences [2, 18]. Common characteristics include localized pain, burning, stinging, rawness, or discomfort during or after intercourse, with emotional and psychological impacts [13, 23]. Dyspareunia may also occur in individuals without vulvar discomfort due to pelvic floor dysfunction, hormonal imbalances, or psychological factors, further complicating diagnosis [18, 19, 24]. The Marinoff Index provides a standardized method for assessing the severity of dyspareunia, which allows for the comparison of sexual pain between women with and without CVD and represents a valuable tool in clinical practice for analyzing pain during sexual activity [25]. However, its broader utility in CVD assessment requires further research. Other validated instruments, such as the Female Sexual Function Index (FSFI) or the Vulvodynia Impact Questionnaire (VIQ), are also frequently used to assess sexual function and dyspareunia in both clinical and research settings [2, 26, 27].

Patients with CVD exhibit diverse demographic profiles, especially those with vulvar dermatoses [28]. Studies show that vulvar dermatoses are more prevalent among older women, with a peak incidence between ages 45-65 [29, 30]. These patients also tend to have higher body mass indices (BMI) and are fewer reproductive-age individuals [2, 31]. Additionally, the vulvar dermatosis group reports higher rates of marriage, childbirth, and abortion, alongside lower educational levels [2, 9].

Research has demonstrated significantly higher comorbidity rates among patients with CVD compared to other groups ($p < 0.0001$) [2]. A substantial percentage of asymptomatic participants, with both normal (63.4%) and impaired (70.7%) vulvar skin, also reported comorbid conditions [32, 33]. Analysis of comorbidity progression revealed distinct patterns, with symptom frequency increasing from asymptomatic individuals to those with vulvodynia, followed by a decline in vulvar dermatosis cases [32, 33]. These findings emphasize the role of autonomic nervous system (ANS) dysfunction, where sympathetic hyperactivity and parasympathetic de-

pression contribute to various comorbidity pathways [18, 34, 35]. The elevated comorbidity rates and overlapping symptoms suggest complex pathophysiology driven by ANS dysregulation [36, 37]. Further exploration of comorbidity clusters may reveal new therapeutic targets and guide the development of multifaceted treatment strategies [33].

1.2. Clinical Evaluation

Colposcopy and vulvoscopy are critical tools for assessing changes in the cervical and vaginal epithelium, as well as the vulvar skin [38, 39]. While colposcopy primarily targets the vaginal and cervical mucosa, vulvoscopy allows for a thorough evaluation of the vulva, particularly with the use of "Three-rings vulvoscopy" (TRIV) for a more detailed examination [8, 40-43]. Both techniques are valuable in identifying abnormalities such as cervical lesions, irritation, or other pathologies contributing to chronic discomfort. When suspicious findings arise during examination, targeted biopsies can be performed for histopathologic confirmation [44, 45].

Previous research has revealed a significantly higher incidence of nonspecific changes in the outer vulvar ring in patients with vulvar dermatosis (70.7%). In contrast, patients with vulvodynia (98.8%) and impaired vulvar skin (96.3%) showed more frequent nonspecific findings in the inner vulvar ring [46]. In patients with vulvodynia, the inner vulvar ring exhibited a distinct profile, with frequent findings of erythema (92.7%), punctuation (54.9%), ischemia (48.8%), and papillae (25.6%). Nonspecific lesions in the middle vulvar ring were observed across all participants, but their appearance varied between vulvodynia and vulvar dermatosis. Establishing these patterns of nonspecific lesions supports the classification of vulvodynia as chronic reflex pain syndrome (CRPS) type 1 under the Budapest criteria. This study proposes a Three-rings vulvoscopy as a valuable diagnostic tool for distinguishing between primary and secondary CVD [43].

The cotton-swab or Q-tip test is a diagnostic method to assess sensitivity and pain response in the vulvar vestibule, a common site for vulvodynia-related pain. Introduced by Crystle et al. in 1971, this simple and cost-effective test is frequently used to evaluate vulvodynia, urethral mobility, and urinary incontinence [47]. It helps identify pain sensitivity at specific vulvar and vestibular sites. Clinicians can map areas of heightened sensitivity and pain by touching various locations on the vulvar rings and assessing the patient's pain response [8, 48, 49].

This paper presents a comprehensive clinical evaluation of CVD by analyzing the Marinoff Index and cotton swab test results from 328 patients in the DATRIV study. These diagnostic methods are pivotal in understanding the underlying causes of chronic vulvar discomfort and tailoring treatment strategies, including pharmacotherapy, physical therapy, psychological support, and surgical interventions.

2. Methods

2.1. Study Design

The DATRIV study (Diagnostic Accuracy of Three Rings Vulvoscopy) was conducted to enhance the diagnosis and treatment of vulvar discomfort [40-43]. It focused on using Three-Rings vulvoscopy. A secondary aim of the study was to establish standardized outcome measures for vulvoscopy.

Lesions observed during the study were categorized based on established principles [50, 51] into dermatological lesions with secondary morphological characteristics, termed "specific lesions," while all other changes were classified as "nonspecific lesions." The location of these lesions, concerning the three vulvar rings, was carefully documented. Regardless of the observed vulvar lesions, vulvodynia was diagnosed according to Friedrich's criteria and recent recommendations [8, 13, 14, 48, 49, 52, 53].

Diagnosing vulvar dermatoses involves identifying specific dermatological lesions with secondary morphological features and evaluating the presence and distribution of nonspecific lesions across the three vulvar rings.

Study participants were divided into four groups based on historical data, responses to the ISSVD (The International Society for Study of Vulvovaginal Diseases) Vulvodynia Pattern Questionnaire, and clinical assessments. Symptomatic patients were subdivided into those with primary or secondary CVD caused by vulvar dermatoses. In contrast, asymptomatic participants were further classified into those with "normal vulva" and those with "impaired vulvar skin." Patients with chronic vulvar discomfort.

Particular focus was placed on sexual activity and dyspareunia, assessed by the Marinoff index and the cotton swab test. The Marinoff Dyspareunia Index is a 4-point scale used to quantify pain severity during intercourse and evaluate sexual function in patients with chronic vulvar pain [25]. The index is divided into three grades:

1. Grade 1: Discomfort that does not prevent intercourse
2. Grade 2: Frequent prevention of intercourse
3. Grade 3: Complete prevention of intercourse

The cotton swab test was performed by gently pressing specific vulvar areas with a cotton swab to identify pain or hyperalgesia (increased pain sensitivity) and allodynia (pain response to non-painful stimuli) [13, 14, 46, 48, 49]. The appearance of a positive cotton swab test can vary among individuals with and without CVD. A positive cotton swab test reveals areas of heightened sensitivity or pain in individuals with vulvar discomfort. The clock face method involves touching six specific points on each vulvar ring, corresponding to two, four, six, eight, ten, and twelve o'clock positions. The three vulvar rings—outer, middle, and inner—represent concentric zones, and this organized mapping systematically evaluates pain responses at various locations and helps identify localized or generalized pain patterns.

The study was conducted at Polyclinic Harni in Zagreb,

Croatia, between December 1, 2011, and December 31, 2016. Exclusion criteria included certain vulvar conditions, incomplete medical records, and protocol deviations. All participant groups underwent TRIV and vulvar biopsy with histopathological examination. Biopsies were routinely performed on symptomatic patients, while asymptomatic individuals were selected from those scheduled for labiaplasty.

2.2. Data Analysis

In this study, statistical methods were used to analyze both qualitative and quantitative variables. The choice of statistical tests depended on the nature and distribution of the variables. Qualitative variables, representing categorical data, were assessed using the chi-squared test with Yates' correction or Fisher's exact test for small sample sizes. The t-test for proportions was applied to examine the differences between the two percentages.

Quantitative variables, representing continuous data with a confirmed normal distribution, were summarized using the arithmetic mean and standard deviation. Analysis of variance (ANOVA) was used to compare means across multiple groups. Post hoc Tukey HSD tests were conducted to determine specific group differences when significant differences were identified. The t-test was employed to compare the means of the two groups.

Nonparametric tests were employed for quantitative variables that did not follow a normal distribution. The Kruskal-Wallis ANOVA was used to assess differences among multiple groups, and the Mann-Whitney U test was used to compare two groups. All statistical analyses were performed using Statistical Package 12.0 on a personal computer (PC).

2.3. Ethical Approval

Participants were explicitly informed about the voluntary nature of their participation in the study and were given the option to decline the questionnaire if they wished. Written informed consent was obtained from patients undergoing vulvoscopy and vulvar biopsy to ensure they fully understood the procedures, potential risks, benefits, and voluntary participation.

The Institutional Review Board of Polyclinic Harni granted ethical approval, as indicated by the Ethical Approval Number (20111201001). This demonstrates compliance with the review board's ethical standards and guidelines.

The DATRIV study was registered on ClinicalTrials.gov under the identifier NCT02732145, ensuring transparency by sharing the study's objectives, design, and results with the research community and the public.

These ethical measures underscore the study's commitment to ethical protocols and protecting participant rights. Adherence to informed consent and voluntary participation is fundamental in research, while ethical approval and study registration enhance these principles and promote research transparency.

3. Results

The impact of vulvodynia and vulvar dermatoses on sexual activity varies markedly across individuals, as demonstrated by data from the DATRIV study (Table 1).

Table 1. *Sexual activity and abstinence due to dyspareunia or lack of a sexual partner in four groups of patients in the DATRIV study.*

Dyspareunia	Normal vulva (N=82)	Impaired vulvar skin (N=82)	Vulvodynia (N=82)	Vulvar dermatosis (N=82)
Sexually active	81 (98.7%)**	77 (93.90%)**	73 (89.02%)**	49 (59.75%)
Sexual abstinence	1 (1.22%)	5 (6.09%)	9 (10.97%)	33 (40.24%)**
Dyspareunia as a cause of sexual inactivity	1 (1.22%)	1 (1.22%)	8 (9.75%)**	1 (1.22%)
Lack of a sexual partner	0	0	9 (10.97%)	32 (39.02%)**

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy

Women diagnosed with primary or secondary chronic vulvar discomfort (CVD) frequently reported reduced sexual activity or complete abstinence. In cases of vulvodynia, dyspareunia emerged as a key factor contributing to sexual avoidance. Recurrent pain during intercourse often led patients to abstain from sexual activity altogether to prevent symptom exacerbation. Additionally, the chronic discomfort and fear of physical pain associated with vulvar dermatoses appeared to reduce the desire for intimacy or the pursuit of new sexual relationships.

Table 2. *The incidence and severity of dyspareunia assessed by the Marinoff index in four groups of patients in the DATRIV study.*

Dyspareunia	Normal vulva (N=82)	Impaired vulvar skin (N=82)	Vulvodynia (N=82)	Vulvar dermatosis (N=82)
Dyspareunia	2 (2.4%)	6 (7.3%)	82 (100%)**	66 (80.5%)**
No dyspareunia /Marinoff index 0	80 (97.56%)	76 (92.68%)	0	0
Marinoff Index evaluated only in sexually active patients	81 (98.7%)**	77 (93.90%)**	73 (89.02%)**	49 (59.75%)
Marinoff index 1	1 (1.22%)	0	22 (30.1%)	7 (20.6%)
Marinoff index 2	0	1 (1.22%)	40 (54.8%)	18 (52.9%)
Marinoff index 3	0	0	11 (15.1%)	9 (26.5%)

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy

Table 2 presents the incidence and severity of dyspareunia, assessed using the Marinoff Index. Women with vulvodynia or vulvar dermatoses exhibited significantly higher Marinoff scores (grades 1–3) compared to women without CVD. Among sexually active women in the general population, a Marinoff score of 0 (indicating no pain) was most common. In contrast, positive Marinoff scores (1, 2, or 3) predominated among women with CVD, underscoring the considerable burden of pain during intercourse in this population.

Mild dyspareunia (Marinoff Index 1), characterized by pain that does not consistently reduce the frequency of intercourse, was more prevalent among CVD patients than among controls, who typically reported transient and less disruptive pain. Moderate dyspareunia (Marinoff Index 2), involving intermittent pain that occasionally prevents intercourse, was more common in the CVD group due to the episodic but distressing nature of their symptoms. Severe dyspareunia (Marinoff Index 3), where pain precludes intercourse entirely, was almost exclusively reported in women with CVD, highlighting the profound functional impairment caused by these conditions. Such severe pain was rarely observed in women without CVD.

Further analysis revealed subtle distinctions in Marinoff scores between primary and secondary CVD, though these differences did not reach statistical significance. Women with vulvodynia more often had Marinoff scores of 2 or 3, indicating frequent or consistent pain, while women with vulvar dermatoses tended to have scores of 1 or 2, suggesting milder but still impactful symptoms.

Table 3. *The incidence and severity of dyspareunia assessed by the Marinoff index in patients with CVD from the DATRIV study.*

Sexual intercourse and vulvar complaints (sexually active patients with CVD)	Vulvodynia (N=73)	Vulvar dermatosis (N=49)
Provocation of vulvar discomfort through intercourse	16 (21.91%)	42 (57.53%)*
Penetration aggravates vulvar complaints***	16 (21.91%)	39 (53.42%)*
Vulvar complaints during the intercourse***	15 (20.55%)	21 (28.77%)
Vulvar complaints after the intercourse***	14 (19.18%)	42 (57.53%)*

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy; ***=based on patients who are sexually active.

Table 3 explores the temporal characteristics of pain during sexual activity, revealing distinct patterns based on the stage of intercourse. Women with vulvodynia, particularly those with vestibulodynia, frequently reported sharp, burning, or stinging pain upon penetration, often severe enough to preclude intercourse entirely. In contrast, women with vulvar dermatoses commonly experience pain that persists or worsens after intercourse. Across both conditions, sexual activity was frequently identified as a provoking and aggravating factor.

Table 4. *The incidence of vulvar complaints depends on the menstrual cycle, using tampons, and urination in patients with CVD from the DATRIV study.*

Menstrual cycle and vulvar discomfort		
	Vulvodynia (N=73)	**Vulvar dermatosis (N=49)**
Influence of menstrual cycle on vulvar discomfort***	45 (54.9%)**	15 (18.3%)
Worsening before menstruation	28 (34.2%)**	5 (6.1%)
Worsening during menstrual bleeding	6 (7.3%)	4 (4.9%)
Worsening after menstrual bleeding	18 (22.0)	7 (8.5%)
Worsening between two menstrual bleeding	4 (4.9%)	3 (3.7%)
Tampon use and vulvar complaints		
Using vaginal tampon	54 (65.9%)**	21 (25.6%)
Not using vaginal tampon	28 (34.1%)**	61 (74.4%)
Tampon aggravates vulvar complaints***	21 (38.9%)	7 (33.3%)
Urination and vulvar complaints		
Worsening during miction	39 (47.6%)	30 (36.6%)
Vulvar complaints during miction after the intercourse***	14 (19.18%)	42 (57.53%)*

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy; ***=based on patients who menstruate, use tampons, and are sexually active

Beyond sexual activity, daily environmental and physiological factors also contributed to symptom exacerbation (Table 4). Menstruation was a significant trigger, especially for patients with vulvodynia, with symptoms worsening predominantly in the premenstrual phase. The use of tampons and sanitary pads often causes additional irritation. Interestingly, tampon use was more frequent among women with vulvodynia compared to those with vulvar dermatoses, although no significant difference in vulvar discomfort was reported between the two groups.

Vulvar discomfort associated with urination did not differ significantly between women with vulvodynia and those with vulvar dermatoses.

Table 5. *The incidence of vulvar complaints among women who cycle and wear tight clothing in patients with CVD from the DATRIV study.*

Cycling and vulvar complaints		
	Vulvodynia (N=73)	**Vulvar dermatosis (N=49)**
Cycle	42 (51.2%)**	19 (23.2%)
Do not cycle	40 (48.8%)	63 (76.8%)**
Cycling aggravates vulvar complaints ***	26 (61.9%)	9 (47.4%)
Tight clothes and vulvar complaints		
Wearing tight clothes	70 (85.4%)**	44 (53.7%)
Do not wear tight clothes	12 (14.6%)	38 (46.3%)**
Vulvar complaints in tight clothes after intercourse***	14 (19.18%)	42 (57.53%)*

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy; ***=based on patients who cycle or wear tight clothes.

Table 5 shows that cycling did not substantially aggravate symptoms in either group. Nevertheless, women with vulvodynia reported

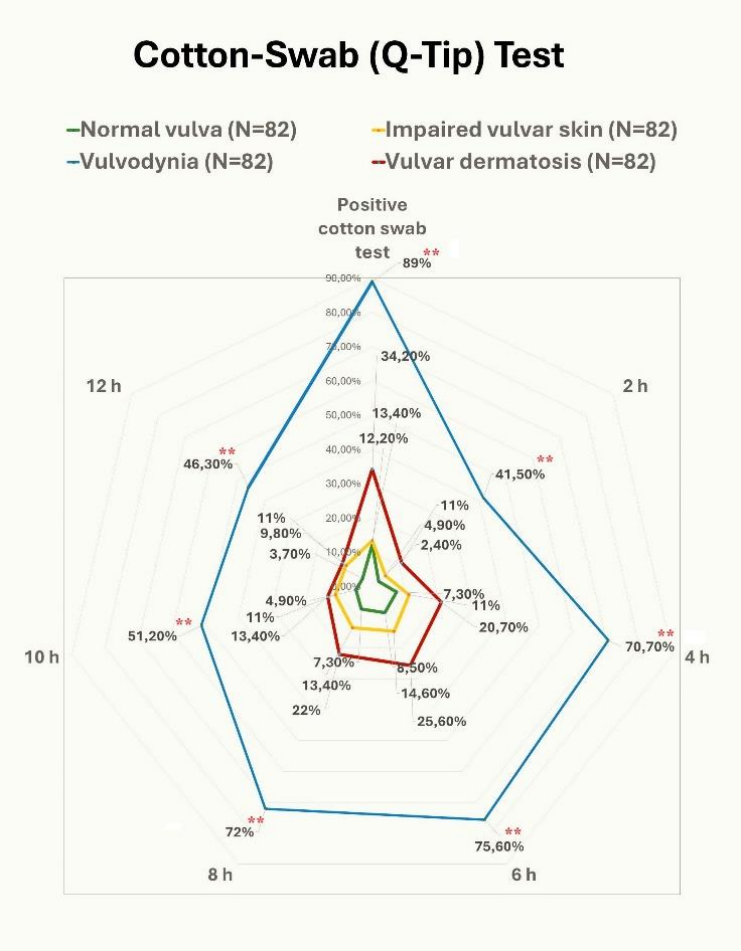
cycling more frequently than those with vulvar dermatoses—a pattern also seen in the frequency of wearing tight-fitting clothing.

Table 6. *The results of the cotton swab test in the inner vulvar ring were obtained from the four patients in the DATRIV study.*

Cotton Swab test	Normal vulva (N=82)	Impaired vulvar skin (N=82)	Vulvodynia (N=82)	Vulvar dermatosis (N=82)
Positive cotton swab test	10 (12.2%)	11 (13.4%)	73 (89.0%)**	28 (34.2%)
Cotton swab test on 2h	2 (2.4%)	4 (4.9%)	34 (41.5%)**	9 (11.0%)
Cotton swab test on 4h	6 (7.3%)	9 (11.0%)	58 (70.7%)**	17 (20.7%)
Cotton swab test on 6h	7 (8.5%)	12 (14.6%)	62 (75.6%)**	21 (25.6%)
Cotton swab test on 8h	6 (7.3%)	11 (13.4%)	59 (72.0%)**	18 (22.0%)
Cotton swab test on 10h	4 (4.9%)	9 (11.0%)	42 (51.2%)**	11 (13.4%)
Cotton swab test on 12h	3 (3.7%)	8 (9,8%)	38 (46.3%)**	9 (11.0%)

*=p<0.05; **=p<0.001; DATRIV=Diagnostic Accuracy of Three Rings Vulvoscopy

Table 6 summarizes the results of the cotton-swab test, which was used to localize tenderness in the vulvar area. Tenderness in the outer and middle rings of the vulva was observed in only one patient with vulvodynia. In contrast, tenderness in the inner vulvar ring was commonly reported among vulvodynia patients, indicating a higher rate of localized pain in this region (Figure 1).



*=p<0.05; **=p<0.001; ROC curve=Receiver-operating characteristic curve

Figure 1. *ROC curve presenting the results of the cotton swab test in the inner vulvar ring.*

4. Discussion

Sexual intercourse acts as both a provoking and aggravating factor in the clinical course of primary and secondary chronic vulvar discomfort (CVD), encompassing vulvodynia and vulvar dermatoses. The pain frequently begins with penetration, resulting from nerve hypersensitivity or fragile epithelial tissues, intensifies during intercourse from frictional trauma, and often persists post-coitally due to sustained inflammatory and neuropathic mechanisms [1, 8, 54].

Multiple interconnected pathophysiological mechanisms are responsible for the exacerbation of symptoms during sexual activity.

Mechanical Trauma: Penetration and friction during intercourse apply pressure to inflamed or hypersensitive vulvar tissues. This leads to epithelial microtrauma, particularly in dermatoses such as lichen sclerosus or planus, where the skin is atrophic and less resilient [1, 54].

Neuropathic Pain: In vulvodynia, altered nerve function—characterized by peripheral and central sensitization—elicits pain both during and after sexual activity, often without identifiable external lesions [8, 30, 55].

Pelvic Floor Dysfunction: Involuntary pelvic muscle hypertonicity, commonly observed in women with vulvodynia, contributes to pain during penetration, further reinforcing a cycle of dyspareunia, muscular tension, and emotional distress [56, 57].

Post-Coital Inflammation: In vulvar dermatoses, the mechanical impact of intercourse can intensify local inflammation, leading to post-coital burning, itching, and irritation [58, 59].

These mechanisms collectively reduce sexual activity in women with CVD. In this study, 9.75% of women with vulvodynia reported sexual abstinence due to dyspareunia, where burning, stinging, or sharp pain on penetration led to avoidance of intimacy. In comparison, a more considerable proportion of women with vulvar dermatoses cited lack of a sexual partner (39.0%) as the primary reason for abstinence rather than the pain itself. Dyspareunia in vulvar dermatoses was attributed more to epithelial fragility and inflammation than neuropathic processes [8, 54].

Hormonal changes, particularly during peri- and postmenopausal periods, further exacerbate symptoms due to reduced estrogen levels, which impair vaginal lubrication and increase mucosal sensitivity during intercourse [60, 61].

The psychosocial consequences of CVD are considerable. Chronic pain and sexual avoidance may strain intimate relationships, leading to emotional detachment and decreased sexual satisfaction. Anticipatory anxiety regarding intercourse can reduce libido and, in some cases, cause vaginismus, perpetuating a cycle of avoidance and distress. Recurrent dyspareunia contributes to sexual frustration, loss of desire, and psychological comorbidities, such as depression and anxiety, all of which further impair sexual function [62-64].

4.1. Marinoff Index Results

The Marinoff Index scores in our study reflect the high burden of dyspareunia in CVD. The index, originally developed to quantify the degree of pain during intercourse, remains a clinically valuable tool in evaluating sexual function in vulvar disorders [65, 66]:

100% of women with vulvodynia and 80.5% with vulvar dermatoses reported grades 1–3 on the Marinoff Index [56, 66, 67].

On the contrary, 98.7% of women without CVD reported a score of 0, indicating no pain during intercourse [66, 67].

Marinoff Index 1 (mild pain, does not reduce frequency): Observed in 30.1% of women with primary CVD and 20.6% with secondary CVD—higher than in controls, where pain was typically transient and non-disruptive [8, 56, 66, 67].

Marinoff Index 2 (pain occasionally prevents intercourse): Present in 54.8% of women with vulvodynia and 52.9% with dermatoses, reflecting intermittent but impactful pain episodes [56, 67].

Marinoff Index 3 (severe dyspareunia, intercourse impossible): Reported in 15.12% of vulvodynia patients and 26.5% of those with dermatoses—almost exclusive to women with CVD [8, 56].

Women with primary CVD (vulvodynia) were more likely to have persistent neuropathic pain and higher Marinoff scores, consistent with literature highlighting central sensitization and vestibular hyperalgesia in these patients [56, 68]. In contrast, those with secondary CVD (e.g., dermatoses) often exhibited fluctuating symptoms related to disease activity [8, 49]. These patients may transition between Marinoff levels based on treatment response and the inflammatory status of their skin condition.

4.2. Pain Across Phases of Sexual Activity

Sexual activity was identified as a provoking factor by 21.9% of women with vulvodynia and 57.5% with vulvar dermatoses, with pain varying by intercourse phase. This variation is well established in literature, showing distinct nociceptive and inflammatory responses depending on the underlying etiology [49, 56, 69].

During penetration, sensitized nociceptors in the vestibule trigger sharp pain, even with minimal touch, in patients with vulvodynia. Q-tip testing studies confirm mechanical allodynia and hyperalgesia at the vestibule [69, 70]. In dermatoses, fragile or inflamed skin is susceptible to tearing and bleeding [30, 55]. During intercourse, friction and pressure exacerbate neural pain in vulvodynia (20.5%) and inflammation in dermatoses (28.8%), consistent with observations in women with chronic vulvar pain syndromes [30, 49, 56]. After intercourse, pain persisted in 19.2% of vulvodynia patients and 57.5% of those with dermatoses due to lingering inflammation and nerve irritation, as also described in studies

documenting post-coital flares [54, 56].

Environmental and lifestyle factors also significantly affect symptom severity. Menstruation was a trigger in 54.9% of vulvodynia patients, with 34.2% reporting worsening in the premenstrual phase. This correlates with literature linking cyclic hormonal fluctuations to altered pain thresholds and mucosal sensitivity [71, 72]. Tampon and pad use provoked discomfort in 65.9% of patients with vulvodynia, often due to friction and vestibular sensitivity. In dermatoses, internal products may exacerbate inflammation or cause microtrauma [49, 55, 73].

Urination aggravated symptoms in 36.6% of dermatosis patients and 47.6% with vulvodynia, especially following intercourse, when mucosal irritation is heightened. Vulvar burning after voiding is also a common feature of vestibulodynia and inflammatory vulvar dermatoses [55, 70, 74].

Cycling worsened symptoms in 61.9% of cycling vulvodynia patients and 47.4% with dermatoses due to perineal pressure and mechanical friction, which aligns with studies on activity-induced flares in patients with vulvar pain [75, 76].

Tight clothing contributed to irritation through mechanical friction and moisture retention, potentially exacerbating symptoms in both neuropathic and inflammatory conditions. Despite this, 85.4% of vulvodynia patients continued to wear tight clothing, while 46.3% of women with dermatoses avoided it, a behavior also noted in patient surveys regarding symptom triggers [3, 73].

4.3. The Cotton-Swab (Q-Tip) Test

The cotton-swab test remains a cornerstone in the diagnostic evaluation of vulvodynia, particularly vestibulodynia [48, 49, 77]. It provides a reproducible method for assessing pain sensitivity across distinct anatomical zones of the vulva and vestibule [48, 57]. By systematically applying light pressure with a cotton swab to various sites, clinicians can determine localized pain responses and identify specific areas of allodynia or hyperalgesia, which are hallmarks of neuropathic pain syndromes [77, 78].

For this purpose, the concept of three vulvar rings was used [41, 42]. This anatomic-functional approach has emerged in the literature as a method to improve pain mapping accuracy and guide both diagnosis and treatment [8, 79].

The vulvar region was conceptualized into three concentric anatomical zones—the outer, middle, and inner vulvar rings—allowing for a structured approach to pain localization. The outer ring comprises the mons pubis, labia majora, and perineum, and the middle ring includes the anterior and posterior commissures, labia minora, and interlabial sulci. The inner ring encompasses the vestibule medial to Hart's line, including the clitoris, urethral meatus and sulcus, hymenal remnants, and the vestibular glands —a region highly relevant to provoked vestibulodynia and frequently reactive during swab testing [8, 49, 80].

4.4. Pain Mapping by Vulvar Rings

In women without CVD, the outer and middle rings were generally non-tender or only mildly sensitive to palpation, reflecting a baseline absence of vulvar pain. These findings are consistent with normative data from control groups in cotton-swab test studies, which consistently report low or no pain thresholds in these anatomical regions [48, 77].

In contrast, patients with CVD, particularly those with vulvar dermatoses such as lichen sclerosus, may report mild discomfort or tenderness in these outer zones, usually as a consequence of chronic inflammation or epithelial atrophy [29, 30, 49]. In this study, only one patient with vulvodynia exhibited a positive cotton-swab response in the outer ring and only one in the middle ring, indicating relatively low pain detection in these regions in patients with neuropathic pain syndromes, where symptoms tend to be focused medially [48, 49].

The inner vulvar ring, or vestibule, emerged as the most clinically relevant site for pain localization. Among patients with vestibulodynia, this area demonstrated pronounced hypersensitivity, with even minimal touch elicited pain described as burning, stinging, or stabbing—hallmarks of mechanical allodynia or hyperalgesia [48, 57]. This clinical presentation correlates with histological and immunohistochemical findings, which show increased densities of C-fiber nociceptors and mast cells, along with epithelial barrier dysfunction, in the vestibular mucosa of women with provoked vestibulodynia [4, 57, 81].

Conversely, patients without CVD consistently reported this area to be pain-free or only mildly sensitive, reinforcing the diagnostic relevance of inner ring hypersensitivity as a defining feature of vulvodynia [48, 57, 77].

4.5. Clock Face Model

To standardize pain assessment further, the cotton-swab test was applied using the clock face model—an approach widely endorsed in clinical and research settings. This method evaluates vestibular pain at six anatomical reference points (2, 4, 6, 8, 10, and 12 o'clock) [8, 77, 82].

In women without CVD, these positions across all vulvar rings did not elicit significant pain, and any transient discomfort was minimal—an observation consistent with normative studies on pain thresholds [4, 77].

In contrast, patients with CVD, particularly those with vestibulodynia, frequently reported intense, localized pain at the 4, 6, and 8 o'clock positions. These locations anatomically correspond to the vestibular glands (Bartholin's and Skene's) and the levator ani muscle insertion sites—areas implicated in peripheral sensitization and myofascial dysfunction [18, 49, 82].

While these pain patterns were most pronounced in the inner ring, some patients with generalized vulvodynia or vulvar dermatoses also exhibited sensitivity in the middle and outer rings, indicating broader pain involvement or dermal inflammation [49, 80]. This spatial pain mapping enables

clinicians to distinguish localized versus generalized pain phenotypes, essential for targeted diagnosis and personalized management strategies [8, 18, 83].

The cotton-swab test remains an indispensable tool in the clinical evaluation of chronic vulvar pain syndromes. Its structured application across the three vulvar rings and standardized clock face positions enables clinicians to:

1) Differentiate vulvodynia and vestibulodynia from other causes of vulvar discomfort [8, 49, 77];
2) Identify whether the pain phenotype is localized or generalized;
3) Select site-specific therapeutic approaches, including topical agents, physical therapy, neuromodulators, or nerve blocks [18, 83].

Incorporating detailed pain mapping into clinical evaluation significantly improves diagnostic accuracy and supports individualized care for women affected by chronic vulvar discomfort [8, 42, 43, 49, 84].

5. Conclusion

This study provides a comprehensive clinical evaluation of women with chronic vulvar discomfort (CVD), offering new diagnostic insights through structured pain mapping and quantitative assessment tools.

Among 328 participants, 100% of women with vulvodynia and 80.5% of those with vulvar dermatoses reported dyspareunia, in sharp contrast to only 1.3% of asymptomatic controls. This is consistent with literature demonstrating a significantly higher prevalence of dyspareunia in vulvodynia and inflammatory dermatoses.

Notably, Marinoff Index 2, indicating pain that occasionally prevents intercourse, was observed in 54.8% of vulvodynia and 52.9% of dermatosis patients, while Marinoff Index 3, representing severe pain that entirely precludes intercourse, was found in 15.1% and 26.5%, respectively. These distributions align with previous gynecologic reports applying the Marinoff grading scale in women with vulvar pain.

Pain mapping using the original three-ring anatomical model and clock-face method revealed that the inner vulvar ring, particularly at 4, 6, and 8 o'clock, was the most pain-sensitive region in vulvodynia. This is consistent with the localized nociceptor hypersensitivity described in neurophysiological and histopathological studies. In contrast, patients with vulvar dermatoses often exhibited diffuse tenderness across all three vulvar rings, reflecting a broader inflammatory pain phenotype.

Environmental and behavioral triggers—such as menstruation (reported by 54.9% of vulvodynia vs. 36.5% of dermatosis patients), tampon use (65.9% vs. 42.8%), urination-related discomfort (47.6% vs. 36.6%), cycling (61.9% vs. 47.4%), and tight clothing (aggravating symptoms in 85.4% of vulvodynia vs. 46.3% of dermatosis patients) were frequently reported in both groups. These findings reflect well-known patterns of mechanical and hormonal triggers exacerbating vulvar sensitivity in vulvodynia and dermatoses.

The combined use of the cotton-swab test and the Marinoff Index, integrated with the three-rings vulvar mapping concept, enhances the diagnostic precision of chronic vulvar pain syndromes. These tools offer clinicians a reproducible framework for identifying specific pain phenotypes, guiding individualized therapeutic strategies, and improving care for women affected by vulvodynia and vulvar dermatoses.

Abbreviations

DATRIV	Diagnostic Accuracy of Three Rings Vulvoscopy
CVD	Chronic Vulvar Discomfort
FSFI	Female Sexual Function Index
VIQ	Vulvodynia Impact Questionnaire
BMI	Body Mass Index
ANS	Autonomic Nervous System
TRIV	Three Rings Vulvoscopy
CRPS	Chronic Reflex Pain Syndrome
ISSVD	The International Society for Study of Vulvovaginal Disease
ROC	Receiver-Operating Characteristic Curve

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Conflicts of Interest

The authors declare no conflicts of interest.

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